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SYSTEMATIC ZOOLOGY.—*Nomenclature and grammar.* CESARE EMILIANI, University of Chicago.[1] (Communicated by James Steele Williams.)

Today, more than ever before, a student of biological sciences finds it difficult to follow both nomenclatural and grammatical rules. Increasing disregard for the classical languages, particularly in the United States, Russia, and the Orient, is largely responsible.

Taxonomic rules state in essence that:

1. Nomenclature must use the Latin language.
2. An organism is known by a generic and a specific[2] name (possibly also by a subgeneric and a subspecific name).
3. These names may be natural or artificial words.
4. Generic names must be used as substantives.
5. Specific adjectives (and presumably participles and pronouns) must conform in gender to the generic names with which they are associated.

Three main problems originate from these rules:

1. Substantives, adjectives, participles, and pronouns; other parts of speech; and artificial words must be distinguished.
2. Gender of generic substantives must be determined.
3. Specific adjectives, participles, and pronouns must be given the proper gender endings.

Several authors in recent years have proposed different solutions of these problems. McAtee (1928) suggested that "generic and subordinate names . . . shall be regarded . . . as arbitrary combinations of letters" and, therefore, except for proved typographical errors, remain as the first author used them. Guba and Linder (1932) proposed to keep unchanged the original spelling even if erroneous. Blackwelder (1941) repeated suggestions previously made by Casey (1890) for determining the gender of generic names by their endings and published lists of endings for these determinations. Richter recommended that all specific adjectives and all specific substantives with *-us* (or *-er*), *-a*, and *-um* endings, should be used in the feminine form (Richter, 1942; Weller, 1950; Bartenstein, 1950). Other authors have made occasional reference to these problems, often publishing partly incorrect statements. Thus Baker (1929) reported that *Zonitoides* should be masculine; Macfadyen and Kenny (1934) and Thalmann (1950) classified as masculine all names ending in *-ides*, *-ites*, and *-oides;* and Bartenstein (1950) concluded that endings in *-ites*, *-on*, and *-opsis* indicate the masculine.

Some of the suggestions that have been made (McAtee, 1928; Guba and Linder, 1932), if accepted, would increase the difficulties of nomenclature because both specific names and their particular endings would have to be remembered. Blackwelder's lists may be misleading, because there are exceptions to all such generalities. Richter has not solved these problems either because substantives, adjectives, participles, and pronouns must still be identified and proper handling of the feminine forms is required. Also his suggestion that all substantives which may end in *-us* (or *-er*), *-a*, and *-um* be used in the feminine form, if applied to words that are exclusively substantives, would be likely to create new names and thus add to the confusion.

[1] The writer is indebted to Dr. J. Marvin Weller, of the University of Chicago, for revising the manuscript.

[2] The term *specific* is used here and in the following as equivalent to *trivial*. The term *specific* is preferred because of its relations to the well-accepted terms *generic* and *subspecific*. To designate the whole nameof a species(*generic* + *specific* names) the term *species name* should be used.

All the foregoing suggestions aim at avoiding the difficulties of Latin grammar. It is the opinion of the writer that, if the Latin language is used, it is impossible to ignore its rules; and that strict observance of these rules is really not so difficult and offers the most convenient solution to the whole problem.

Students are inclined to spend much time checking earlier authors to resolve orthographic doubts. A quicker and safer course is to consult good Latin and Greek dictionaries. As shown below, this can be done easily by persons totally ignorant of the classics. A rational use of dictionaries and the few suggestions that follow, will help to solve most controversial issues definitely. The exceptions that may occur do not impair the procedure.

GENERIC NAME

I. IF GENERIC NAME IS A SUBSTANTIVE

1. Simple substantives. Ex.: *Arca, Asperitas, Battus, Chiton, Lagena, Murex, Oenone, Venus.* Consult dictionaries for gender determinations.

2. Compound substantives. Ex.: *Aulocaulis, Cyphosoma, Dictyonema, Homotrema, Orthoceras, Tetrataxis.* Determine the genders of the last parts (*-caulis, -soma, -nema*, etc.) by looking them up in the dictionaries.

3. Simple or compound substantives with diminutive suffixes *-lus, -ulus, -culus, -unculus, -inus, -ellus, -illus, -iolus*, and their feminine (*-a*) and neuter (*-um*) forms. Ex.: *Atrypina, Atrypella, Avicula, Modiolus, Pectunculus, Scutella, Vulvulina, Asonoina, Cushmanella, Haeckelina, Paalzowella, Schubertella, Wiesnerella.* Gender is determined by endings (*-us*, m; *-a*, f.; *-um*, n.). Many words having these endings, however, are not diminutive forms, and dictionaries should be consulted in all cases of doubt. Barbaric names (*Asanoina, Cushmanella, Haeckelina*, etc.) should be easily recognizable.

II. IF GENERIC NAME IS A SUBSTANTIVIZED ADJECTIVE OR PARTICIPLE

1. Simple or compound adjectives and participles with three endings (in Latin mostly: *-us* or *-er*, m.; *-a*, f.; *-um*, n.; in Greek mostly: *-ος*, m.; *-η*, f.; *-ον*, n.). Ex.: adjectives: *Arctica, Blainvillea, Bronteus, Carpenteria, Entosolenia, Flintia, Indiana, Metagraulos, Michelinia, Viviparus;* participles: *Corrugata, Composita, Optatus.* Gender is determined by ending.

2. Simple or compound adjectives with two endings (in Latin: *-is*, m. and f.; *-e*, n.; in Greek: *-ος, -ωρ, -ως, -ης, -ις, -υς*, m. and f.; *-ον, -ωρ, -ες, -ι, -υ*, n.). Ex.: *Daiphron, Epelys, Monoceros, Vitalis.* These names have one ending for masculine and feminine, and another for neuter. Note that since the Greek endings *-ον*, *-ωρ*, and *-ης*, *-ες*, are transliterated into Latin simply as *-on* and *-es*, transliterated names of this type do not indicate any particular gender.

3. Simple or compound adjectives and participles with one ending (various types). Many of these names are indifferently masculine, feminine, or neuter (*Vagans, Anomalinoides*, and practically all names in *-oides*). Others may be masculine or feminine (*Apus, Harpax, Monyx, Calliops, Ogygopsis*, most classical and all post-classical names ending in *-ops* and *-opsis* derived from the Greek words *ὄψ*, *ὤψ*, and *ὄψις*, meaning "look, appearance"). A few are exclusively masculine (*Gennadas*) or feminine (*Hyalopis, Monopis*). It should be noted that some names ending in *-oides* and several derived from *ὄψ*, *ὤψ*, and *ὄψις* are substantives and, therefore, have determinate genders (*Ooides, Cyclops, Diopsis*). On the other hand, many names with the endings *-ops* and *-opsis* (*Penelops, Scalops, Lycopsis*) are substantives having different etymologies and genders (usually masculine, but also feminine). Use of dictionaries is necessary to distinguish these.

Adjectives of type 2 and 3, and participles of type 3, have caused the greatest confusion in nomenclature, because their genders are very often indeterminate. It would be most helpful if these were established by convention. This can be done easily if these names are thought of as referring to the word *forma* (or *concha* for shelled animals). Thus their genders would be established as feminine. The same procedure could be applied to substantives that may be either masculine or feminine (*Pais, Vindex*), thus considering them as feminine. Names that may be either substantives or adjectives (*Tribon*) should be interpreted as substantives, to agree with the substantival character of the generic name.

III. IF GENERIC NAME IS ANOTHER PART OF SPEECH

1. Pronouns. Ex.: *Mea, Quisque, Utra.* Most pronouns have different forms for different genders.

2. Verbs, participles excepted, and other parts of speech. Ex.: *Vireo, Extra, Ita, Parce.* All these names should be considered neuter.

IV. IF GENERIC NAME IS AN ARTIFICIAL, BARBARIC, OR MISSPELLED WORD

1. Artificial combinations of letters Ex.: *Aa, Neda, Nonion, Salifa, Torix.*

2. Barbaric unlatinized names. Ex.: *Macao, Scalez, Vanikoro.*

3. Names with misspelled endings. Ex.: *Batocrinus* (for *Batocrinon*), *Graphiadactyllis* (for *Graphiodactylus*).

The genders of these names can be established as masculine or neuter if they have obvious masculine or neuter endings. All others, including barbaric names, may be considered as feminine (in analogy to the suggestion in II, 3 above).

SPECIFIC NAMES

I. IF SPECIFIC NAME IS A SUBSTANTIVE

Specific substantives may be either in the nominative singular in apposition to the generic name (*Retepora archimedes*), or in the genitive as a possessive term (*Rotalia beccarii*).

II. IF SPECIFIC NAME IS AN ADJECTIVE OR A PARTICIPLE

The gender of a specific adjective or participle must conform with the gender of the generic name. Simple instructions on how to select proper gender endings are given below. It should be noted that accordance must be observed also with compound names like *acutangulus*, which, if used with a feminine generic name, becomes *acutangula*, or with a neuter name *acutangulum* (cfr. *semicanis, -e; semicirculus, -a, -um; sexangulus, -a, -um; unicalamus, -a, -um; unimanus, -a, -um;* etc.).

Names that may be either substantives or adjectives should be considered adjectives in agreement with the adjectival character of the specific name.

III. IF SPECIFIC NAME IS ANOTHER PART OF SPEECH

1. Pronouns. Pronouns that have different forms for different genders should follow accordance rules (*Spondylospira alia*).

2. Verbs, participles excluded, and other parts of speech. All these names should be considered invariably as appositions.

IV. IF SPECIFIC NAME IS AN ARTIFICIAL, BARBARIC, OR MISSPELLED WORD

Names of this type similar to those used for generic names have been employed for species. They should be treated invariably as appositions.

USE OF LATIN AND GREEK DICTIONARIES

I. LATIN AND GREEK ALPHABETS

To consult Latin and Greek dictionaries it is necessary to know the Greek equivalents of Latin letters. These are given below:

α	a	ι	i	ρ	r
β	b	κ, ϰ	c, k	σ, ς	s
γ	g	λ	l	τ	t
δ	d	μ	m	υ	y
ε	e	ν	n	φ	ph
ζ	z	ξ	x	χ	ch
η	e	ο	o	ψ	ps
ϑ	th	π	p	ω	o

II. LATIN AND GREEK DICTIONARIES

Recommended dictionaries are: Harper's *Latin dictionary* and Liddell and Scott's *A Greek-English lexicon.* For Greek proper names, not included in Liddell and Scott, Harper's *Dictionary of classical literature and antiquities* may be used. These are standard dictionaries available at all good libraries.

Special problems can be solved by consulting the following larger dictionaries: Forcellini: *Totius Latinitatis lexicon;* Estennes: *Thesaurus Graecae linguae;* De-Vit: *Totius Latinitatis onomasticon.*

III. USE OF LATIN DICTIONARIES

In the Latin dictionaries above mentioned, a substantive is represented by a word followed by the genitive ending and a gender notation: *m.* for masculine; *f.*, for feminine; and *n.*, for neuter. Ex.: *lupus, i,* m.

An adjective or a participle is represented by a word followed by:

1. Two gender endings and the notation *adj.* or *Part.* Ex.: *albus, a, um,* adj.; *expansus, a, um,* Part. These names have different forms for the three genders: *albus* and *expansus* for the masculine; *alba* and *expansa* for the feminine; *album* and *expansum* for the neuter.

2. A gender ending and the notation *adj.* Ex.: *habilis, e,* adj. These adjectives have the same form, *habilis,* for the masculine and feminine and another, *habile,* for the neuter.

3. The genitive ending and the notation *adj.* or *Part.* Ex.: *audax, acis*, adj.; *virens, entis*, Part. Such names have the same endings for all genders.

Words other than substantives, adjectives, or participles, are easily recognized by such notations as *pron.*, *adv.*, *prep.*, *conj.*, etc., or by their English meaning.

IV. USE OF THE GREEK DICTIONARIES

Greek, in contrast to Latin, has articles which are used in the dictionaries to indicate gender. These are: ὁ masculine; ἡ feminine; and τό neuter.

In the Greek dictionaries above mentioned, substantives are represented by a word followed by the article. Ex.: *δστρακον, τό*, which is consequently neuter.

An adjective is represented by a word followed by:

1. Two gender endings. Ex.: *δίκαιος, η, ον*. These adjectives have different forms for the three genders:, *δίκαιος* m.; *δικαίη*, f.; *δίκαιον*, n.

2. One gender ending. Ex.: *ἀνάλογος, ον*; *εὐγενής, ές*. In such cases, the first forms, *ἀνάλογος, εὐγενής*, are either masculine or feminine, and the second ones, *ἀνάλογον, εὐγενές*, are neuter.

3. The genitive ending and two articles. Ex.: *ἄρπαξ, αγος, ὁ, ἡ; φαῖνοψ, οπος, ὁ, ἡ*. Such names have the same ending for both masculine and feminine and no neuter form.

Words that are neither substantives nor adjectives, may be recognized by their English meaning.

LATINIZATION OF GREEK WORDS

Greek words are latinized by transliterating according to the equivalents noted above and in addition the following:

final η	a	final ος	us	γχ	nch	ἐ, ἠ	he
αι	e	final ον	um	γκ	nc	ἰ	hi
ει, ῃ	i	ου	u	ῥ	rh	ὀ, ὠ	ho
οι, φ	e	γγ	ng	ἁ	ha	ὐ	hy

Also it should be noted that Greek adjectives with the two endings *-ος*, m. and f.; *-ον*, n., have three forms in Latin: *ἀνάλογος, analogus*, m.; *ἀνάλογος, analoga*, f.; *ἀνάλογον, analogum*, n.; *βάρβαρος, barbarus*, m.; *βάρβαρος, barbara*, f.; *βάρβαρον, barbarum*, n.

DETERMINATION OF GENDER

Two examples will suffice to illustrate the process of determining the genders of names. Consider the generic names *Lepas* and *Cyphosoma*.

In the Latin dictionary *Lepas* is found as *Lepas, adis*, f., and therefore this is a feminine substantive.

Compound words usually will not be found as such in the dictionaries. However, they will be easily recognized because their initial parts will be found as independent words. Once the compound character of the word has been recognized, only its latter part needs to be considered for the gender determination. Thus *Cyphosoma* is a compound word formed by *Cypho* and *soma*. The latter does not occur in the Latin dictionary. By transliteration into Greek this becomes *σομα* or *σωμα* (Latin *o* corresponds to the two Greek letters *o* and *ω*). The latter appears in the Greek dictionary as *σῶμα ,τό*. *Cyphosoma* is therefore a neuter substantive.

LIMITATIONS

Some possibilities of error or doubt remain:

1. Misspelled names and failure to recognize barbaric and artificial words as such may lead to wrong identifications in the dictionaries.

2. Declinable words in cases other than the nominative singular (*Amantis*) may not be found in the dictionaries.

3. The same word may be found to have different values and meanings. As suggested, names that may be either substantives or adjectives should be considered substantives, if used as generic names, or adjectives, if used as specific names. Other names may be either substantives or adverbs (*Parum*), pronouns or adverb (*Alia*), verbs or adverbs (*Parce*), etc. No rule can be set for these names, and each must be considered individually. They occur very rarely.

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ZOOLOGY.—Adercotryma, *a new Recent foraminiferal genus from the Arctic.*

ALFRED R. LOEBLICH, JR., and HELEN TAPPAN, U. S. National Museum.

In a current restudy of the foraminiferal genotype species, the writers have encountered numerous species that do not agree with the generic descriptions or the genotype species of the genera to which they had been assigned. This is especially true of the Lituolidae. In his excellent work on the Foraminifera of the Gullmar Fjord and the Skagerak, Höglund (1947, p. 132) did much to clarify some of these problems and subdivided the genus *Haplophragmoides* Cushman. From *Haplophragmoides* sensu stricto he differentiated two genera, *Labrospira* Höglund and *Ammoscalaria* Höglund. However, the writers feel that one species which Höglund treated in this paper, *Haplophragmoides glomeratum* (Brady) is also sufficiently distinct to warrant separate generic status, based on differences in shell morphology and form and position of aperture. These features are considered to be of fundamental importance in the classification of the Foraminifera.

Family LITUOLIDAE

Adercotryma Loeblich and Tappan, n. gen.

Genotype (type species): *Lituola glomerata* Brady, 1878.

Test free, planispiral, subglobular or ovate, elongate in the direction of the axis of coiling, slightly asymmetrical; wall agglutinated; aperture may be lacking in the final chamber, or when present is interio-marginal, forming a low slit or arch near the umbilicus of one side, and closer to the umbilicus than to the periphery.

Remarks.—*Adercotryma* differs from *Haplophragmoides* Cushman, as based on the genotype species, in being somewhat asymmetrical, in being completely involute, rather than slightly evolute, in having the greatest dimension in the axis of coiling, rather than in being somewhat compressed, and in the character of the aperture, which is found near the umbilicus of one side rather than in the plane of coiling at the periphery, or may even be completely lacking in the final chamber.

Adercotryma glomeratum (Brady)

Figs. 1–4

Lituola glomerata Brady, Ann. Mag. Nat. Hist., ser. 5, **1**: 433, pl. 20, figs. 1a–c. 1878.

Haplophragmium glomeratum (Brady) Goës, Kongl. Svenska Vet.-Akad. Handl. **25** (9): 23, pl. 5, figs. 134–139. 1894.

Haplophragmoides glomeratum (Brady) Cushman, U. S. Nat. Mus. Bull. 71 (1): 104, figs. 158–161. 1910; U. S. Nat. Mus. Bull. 104, pt. 2: 47, pl. 9, fig. 6. 1920; Höglund, Zool. Bidrag Uppsala: 135, pl. 10, figs. 3–4, text fig. 112, 1947; Cushman, Cushman Lab. Foram. Res. Spec. Publ. 23: 28, pl. 2, fig. 16. 1948.

Test free, subglobular to slightly ovate, planispiral but somewhat asymmetrical, with about two whorls present, greatest dimension in the axis of coiling, periphery broadly rounded; chambers few in number, only the four of the final whorl visible, very broad and low, slightly inflated, somewhat wedge-shaped with the narrower portion on the side with the aperture; sutures distinct, rather straight, slightly constricted; wall rather coarsely arenaceous, with considerable cement between the grains; aperture may be indistinct or lacking, or form a short slit or low arch at the inner margin of the final chamber, about one-half to two-thirds the distance from the periphery to the umbilicus, on the narrower side of the test.

Remarks.—Brady (1878, p. 433) in describing this species states, "Aperture at the inner margin of the terminal chamber, near the exterior of the corresponding segment of the previous convolution, simple, often obscure." Cushman (1948, p. 28) states that the aperture is "a short slit at the base of the chamber, often obscured by sand grains." It remained for Höglund (1947, p. 135, pl. 10, fig. 4) to clearly demonstrate the position of this aperture. He found the aperture to be "interio-marginal, forming a short slit at the margin of the last chamber, near the narrow end of the oviform test, most frequently indistinct or even lacking." In any large series of specimens, apertures are occasionally seen. These are of two types, either a low arch about halfway between the periphery and the umbilicus (Figs. 2, 3, 4b) or forming a slit that extends along the inner margin of the final chamber to the umbilicus (Fig. 1b). Höglund suggested that specimens lacking an aperture might be in a growth stage in which it had not yet been developed. It is possible that different stages of growth may account for the two variations of apertures here mentioned.

Types and occurrence.—Figured hypotypes (USNM P. 829a–c) and unfigured hypotypes (USNM P. 830) from mud and sand bottom off the south end of Humboldt Glacier, northwest Greenland at a depth of 110 fathoms; collected by Capt. Robert A. Bartlett. Figured hypotype (USMN P. 831) and unfigured hypotypes (USNM P. 832) at a depth of 50 to 57 fathoms, off Clavering Island, northeast Greenland; collected by Capt. Robert A. Bartlett. This species has been widely recorded in both the Atlantic and Pacific Oceans.

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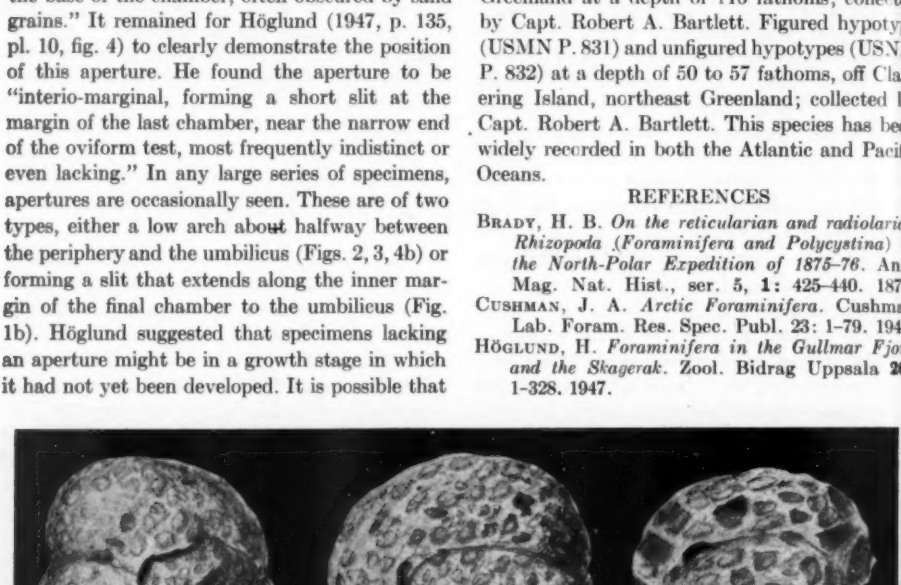


FIGS. 1–4.—*Adercotryma glomeratum* (Brady): 1a, Side view of hypotype (USNM P. 831) showing four chambers of final whorl, and aperture extending into the umbilical area; 1b, edge view of same showing test slightly elongated along axis of coiling, somewhat wedge-shaped chambers and slitlike aperture; 2, edge view of hypotype (USNM P. 829a) showing low archlike aperture; 3, edge view of hypotype (USNM p. 829b) showing short slitlike aperture; 4a, side view of hypotype (USNM P. 829c); 4b, edge view of same showing low arched aperture. Illustrations are shaded camera-lucida drawings by Sally D. Lee, scientific illustrator, Smithsonian Institution. All ×150.

ZOOLOGY.—Buccella, *a new genus of the rotalid Foraminifera.* HAROLD V. ANDERSEN, Louisiana State University. (Communicated by Alfred R. Loeblich, Jr.)

In 1948–1950, while working with foraminiferal faunules from the mudlumps off the Passes of the Mississippi River, the need for a new genus of Foraminifera became apparent. The species selected as the genotype, and also designated the genotype in this paper, has recently been described by Phleger and Parker (1951) as *Eponides hannai*. The morphologic feature of *E. hannai* that makes the species untenable as an *Eponides*—the presence of multiple apertures on the ventral side of the test—constitutes the diagnostic morphologic feature of the new genus *Buccella* introduced in this paper.

Also characteristic of *E. hannai* is a coating of pustules on the ventral side of the test. This morphologic feature was the medium by which the following species and varieties of *Eponides* in the U. S. National Museum and Cushman Collections were brought into the present study:

Eponides alabamensis Cushman and McGlamery, 1938
Eponides choctawensis Cushman and McGlamery, 1938
Eponides frigida (Cushman), 1921 (1922)
Eponides frigida (Cushman), var. *calida* Cushman and Cole, 1930
Eponides hannai Phleger and Parker, 1951
Eponides mansfieldi Cushman, 1930
Eponides mansfieldi Cushman, var. *oregonensis* Cushman, Stewart and Stewart, 1947 (1948)
Eponides peruviana (d'Orbigny), Cushman and Kellett, 1929; Cushman, Stewart and Stewart 1930; and Cushman and Parker, 1931
Eponides vicksburgensis Cushman and Ellisor, 1931

When the types of the above species were studied, discrepancies were noted between the descriptions and illustrations and the actual specimens, and within suites of specimens bearing the same specific designation. As a result of these discrepancies, three new species of the genus *Buccella* (*depressa*, *inusitata*, and *parkerae*) are described, and five species of Eponides (*hannai*, *frigida*, *mansfieldi*, *mansfieldi* var. *oregonensis*, and *vicksburgensis*) are placed in the genus *Buccella*. Emended descriptions and new figures of the above species of "*Eponides*," with the exception of "*E.*" *mansfieldi* var. *oregonensis*, are presented to record the morphologic features omitted in the original descriptions that justify the assignment of these species to the genus *Buccella*.

Also as a result of this study, "*Eponides*" *frigida* (Cushman) is eliminated as a typical species of *Eponides* as suggested by Hofker (1950).

Acknowledgments.—The preparation of this paper was facilitated by the following people whose assistance and contributions are gratefully acknowledged: Dr. G. Arthur Cooper and Dr. Alfred R. Loeblich, Jr., U. S. National Museum, who placed the National Museum samples and equipment at the writer's disposal and aided in the preparation of this report; Miss Ruth Todd, U. S. Geological Survey, who reviewed the manuscript and supplied the samples from which the new species were described; Mrs. Sally Lee, who did such a commendable job in the preparation of the illustrations; and my wife, Dorothy S. Andersen, who assisted in the final preparation of the manuscript.

Family ROTALIIDAE

Buccella Andersen, new genus

Genotype: *Eponides hannai* Phleger and Parker.

Test free, calcareous perforate, multilocular with chambers arranged in a trochoid coil; biconvex. Dorsal side with all chambers and sutures visible; ventral side with sutures, umbilicus, and basal margin of adult chamber concealed wholly or in part with a coating of pustulose material. The primary aperture, interiomarginally situated about midway between the umbilicus and periphery on the ventral and anterior side of the last-formed chamber, is visible only from the interior of the chamber on well-preserved specimens. Single or multiple supplementary apertures, visible in some species, are developed at the postero-sutural margin of each chamber on the ventral side of the test and are typically situated in the distal portion of the chamber near the periphery.

Remarks.—The most obvious feature of the genus *Buccella* is the development of pustules on the ventral side of the test, which conceals the sutures, umbilicus, and basal, anterior margin

of the adult chamber. The diagnostic feature of *Buccella* is its supplementary apertures that are visible in a few species, but concealed in most. Weathering usually reveals the position and shape of the supplementary apertures in those species in which well-preserved specimens bear a thick coating of pustules along the ventral sutures.

Buccella can be differentiated from *Eponides* on the basis of the pustulose coating and supplementary apertures on the ventral side of the test, and from *Pseudoeponides* by the absence of elongate slits on the dorsal side of the chambers. *Eponides* has a single, simple and visible aperture at the base of the last formed chamber between the closed umbilicus and the periphery on the ventral side of the test. *Pseudoeponides* has a small, crescentic opening at the ventral border of the last chamber; loop-shaped openings along the ventral sutures radiating from the umbilicus; and elongate slits on the dorsal side at the middle part of the inner margin of each chamber.

Range.—Oligocene to Recent.

Buccella hannai (Phleger and Parker)

Figs. 3a–c

Eponides hannai Phleger and Parker, Geol. Soc. Amer. Mem. 46: 21, pl. 10, figs. 11–14. 1951.

Emended diagnosis.—Test small; trochoid; biconvex, ranging from specimens with equal convexity on dorsal and ventral sides to specimens that are extremely convex on the dorsal side and nearly flat on the ventral side. Dorsal side with surface smooth, finely perforate and hyaline (in well-preserved specimens); and with curved and limbate sutures that form the peripheral margin of each chamber. Ventral side with surface more coarsely perforate than the dorsal surface; sutures depressed and radial; chambers slightly inflated; and with umbilicus, sutures, and anterior basal margin of last-formed chamber bearing a coating of pustulose material. Periphery distinctly lobulate; typically acute and limbate although an occasional specimen (not necessarily all young specimens) has a very rounded periphery. The number of chambers in the last-formed whorl range from 7 to 9, the most common being 8. Adult tests have 3 to 3¼ coils.

The only visible apertures are the supplementary apertures on the ventral side of the test. Each aperture is a low arched opening located at the posterosutural margin of each chamber. In those specimens with an acute periphery, the supplementary apertures are in a slight depression at the outer margin of the suture near the periphery. In those specimens with a rounded periphery, the apertures are located about midway between the periphery and the umbilicus.

When viewed from the interior, the adult chamber has an irregular-shaped primary aperture at the base and inner margin of the anterior wall; a septal foramen irregularly elliptical in outline and typically areal in the posterior wall that connects chambers in the same coil; and, in those forms examined, a round, septal foramen dorsally situated that connects adjacent chambers in previous coils.

Dimensions of figured specimen: Maximum diameter 0.38 mm.; maximum thickness 0.19 mm.

Remarks.—The typical form of *Buccella hannai* is easily distinguished from all other Recent species. It can be differentiated from *B. inusitata* by its smaller test and single posterosutural aperture in each chamber; from *B. frigida* by its less inflated test and visible supplementary apertures; and from *B. depressa* by its acute periphery, convex umbilicus, and visible supplementary apertures. The Oligocene form *B. vicksburgensis*, which might conceivably be the ancestor of *B. hannai*, has a less distinctly lobulate periphery and lacks the visible supplementary apertures of *B. hannai*.

Types and occurrence.—Reported from depths less than 100 meters in the northwest Gulf of Mexico (Phleger and Parker, 1951). Holotype (U.S.N.M. no. P. 835) and paratypes (U.S.N.M. nos. P. 836 and P. 838) from station 374 (lat. 28°24′ N., long. 94°42.5′ W.) at 35 meters water depth. Paratype (U.S.N.M. no. P. 837) from station 288 (lat. 26°30.5′ N., long 96°33′ W.) at 59 meters water depth.

Also recovered from a mudlump island (L.S.U. Geology Museum Sample no. M-144) off South Pass of the Mississippi River, Louisiana (H. V. Howe Collection no. 4435).

Buccella frigida (Cushman)

Figs. 4a–c, 5, 6a–c

Pulvinulina frigida Cushman, Contr. Can. Biol. 1921: 12. 1922.

Eponides frigida (Cushman), Cushman, U. S. Nat. Mus. Bull. 104, pt. 8: 45 (in part). 1931.

Eponides frigidus (Cushman), Cushman, Contr. Cushman Lab. Foram. Res. **17:** 37, pl. 9, figs. 16, 17. 1941.

Eponides frigida (Cushman), var. *calida* Cushman and Cole, Contr. Cushman Lab. Foram. Res. **6** (4): 98, pl. 13, figs. 13a–c. 1930; Cushman, U. S. Nat. Mus., Bull. 104, pt. 8: 47. 1931; Cushman, Cushman Lab. Foram. Res. Special Publ. **12:** 34, pl. 4, figs. 19, 20. 1944.

Emended diagnosis.—Test small; trochoid; biconvex. Dorsal side with smooth surface; and with narrow, slightly curved and limbate sutures oriented oblique to the peripheral margin. Ventral side with surface smooth and finely perforate; sutures slightly depressed, curved to radial, and filled with opaque pustulose material; chambers slightly inflated; and with umbilicus and basal margin of last-formed chamber bearing a thick coating of pustules. Periphery slightly lobulate, and broadly rounded. The number of chambers in the last-formed whorl range from 5 to 7, the most common being 6. Adult tests have 2¼ to 3 coils.

In well-preserved specimens, all apertures are concealed by pustulose material. Weathered specimens exhibit, as shown in Fig. 5, an arched primary aperture at the basal margin of the final chamber about midway between the umbilicus and periphery, and low arched supplementary apertures located in slight depressions at the outer margin of the sutures near the periphery.

When viewed from the interior, narrow septal foramen, typically areal, connect chambers in the same coil.

Dimensions of figured specimens: lectotype (Figs. 6a–c), maximum diameter 0.46 mm., maximum thickness 0.20 mm.; hypotype (Figs. 4a–c), maximum diameter 0.46 mm., maximum thickness 0.22 mm.; and hypotype (Fig. 5), maximum diameter 0.40 mm., maximum thickness 0.20 mm.

Remarks.—The redefinition of *Buccella frigida* (Cushman) resulting from this study can be attributed to two factors: (1) That none of the original specimens identified as *Pulvinulina frigida* Cushman (1921) has been figured; and (2) that the literature has never clearly demonstrated the difference between *Eponides frigidus* (Cushman) and *E. frigida* (Cushman), Var. *calida* Cushman and Cole.

Subsequent to 1931, Cushman designated three cotypes of "*E.*" *frigidus* (Cushman Collection nos. 3031 (two specimens) and 3032 (one specimen)). On the basis of these cotypes, "*E.*" *frigida* (Cushman), var. *calida* Cushman and Cole has to be placed in synonymy with "*E.*" *frigidus*. This observation is insured in this paper by refiguring the holotype of "*E.*" *frigida*, var. *calida* (Fig. 4), and by figuring for the first time in any publication one of the cotypes (herein designated the lectotype) of "*E.*" *frigidus* (Fig. 6).

Buccella frigida (Cushman) is an extremely variable species. The typical form is relatively small and robust, with a broadly rounded periphery, six to seven chambers in each whorl, and ventral sutures that are slightly curved. This form commonly occurs in samples from Hudson Bay and along the Atlantic coast as far south as Maryland. The Pacific coast forms are generally larger and have straighter sutures, but have the same number of chambers and the thick pustulose coating in the umbilicus. Despite these differences, it appears to be inadvisable to separate the two forms at this time since both forms may occur in the same sample along with transitional forms.

B. frigida more closely resembles *B. depressa* than any other Recent or late Tertiary species. It differs from *B. depressa* by its thicker coating of pustulose material which completely fills the umbilicus and sutures, by the fewer number of chambers in each whorl, by the smaller size of the test, and by the limbate chambers on the dorsal side of the test.

Types and occurrence.—Lectotype (Cushman Collection no. 3032) from station 5, bay between Black Whale and Olasks Harbors, east coast of Hudson Bay (about lat. 55° N.) at 10 fathoms water depth. Hypotype (of "*E.*" *frigida* (Cushman), var. *calida* Cushman and Cole (Cushman Collection no. 14213)), from the Pleistocene, Talbot formation, Wailes Bluff, near Cornfield Harbor, St. Marys County, Md. Hypotype (Cushman Collection no. 64505), off Pocasset, upper end of Buzzard Bay, Mass.

Buccella depressa Andersen, n. sp.

Figs. 7a–c, 8

Eponides peruvianus Cushman and Parker (not d'Orbigny), Proc. U. S. Nat. Mus. **80** (art. 3): 19 (not figured). 1931.

Test of medium size; trochoid; dorsal and ventral sides equally biconvex. Dorsal side with surface smooth, finely perforate and hyaline (in well-preserved specimens); and with slightly curved sutures oriented oblique to the peripheral margin. Ventral side with surface more coarsely perforate than the dorsal surface; sutures greatly

depressed, nearly radial, and partly filled with opaque pustulose material; chambers inflated; and with depressed umbilicus and basal margin of last-formed chambers bearing a moderate coating of pustulose material. Periphery broadly acute to rounded and lobulate. The number of chambers in the last formed whorl ranges from 7 to 9, the most common being 8. Adult tests have 2½ to 3 coils.

In well-preserved specimens all apertures are concealed by pustulose material. Weathered specimens exhibit, as shown in Fig. 8, a low arched primary aperture at the basal margin of the last-formed chamber and slitlike supplementary apertures that extend along the outer postero-sutural margins of each chamber.

When viewed from the interior of the test, a narrow septal foramen interomarginally situated connects chambers in the same whorl. A single round septal foramen more or less centrally located in the dorsal side of the chamber connects adjacent chambers of previous coils.

Dimensions of figured specimens: Holotype, maximum diameter 0.46 mm, maximum thickness 0.20 mm; paratype, maximum diameter 0.49 mm, maximum thickness 0.22 mm.

Remarks.—Pacific coast specimens with pustulose material on the ventral side of the test, which were not identified as *"Eponides" frigida* or its variety *calida*, have been indiscriminately grouped under *Eponides peruviana* (d'Orbigny) [Cushman and Kellett (1929), Cushman, Stewart, and Stewart (1930), Cushman and Valentine (1930), and Cushman and Parker (1931a)]. The Cushman and Kellett specimen has been placed in synonymy with *V. inusitata;* the Cushman, Stewart, and Stewart specimen is too badly weathered to be properly identified; the Cushman and Valentine specimen is neither *Eponides* nor *Buccella;* and the Cushman and Parker assemblage is the basis of this species *B. depressa*. The designation of the Cushman and Parker specmens as a new species is deemed advisable rather than to perpetuate an assumption that *Rotalia peruviana* d'Orbigny has a pustulose coating on the ventral side of the test.

In general appearance, *B. depressa* resembles the larger specimens of *B. frigida*. Differentiation between the two is based on the number of chambers, appearance of sutures, and intersity of the pustulose coating. *B. depressa* has more chambers in each whorl, much more depressed sutures and umbilicus, less pustulose material deposited in the sutures and umbilicus, and less limbate sutures on dorsal side than *B. frigida*. Other Recent species, *B. hannai*, and *B. inusitata*, can be distinguished from *B. depressa* by their acute peripheries.

Types and occurrence.—Holotype (U.S.N.M. no. P. 833) and paratype (U.S.N.M. no. P. 834) from station 97, Port Williams, Falklands, at 8 to 10 fathoms. Unfigured paratypes (Cushman Collection no. 21256) from same locality as above and unfigured paratypes (Cushman Collection no. 21257) from station 87, off lower jetty, Port Howard, Falklands, at 4 fathoms.

FIG. 1, 2.—*Buccella vicksburgensis* (Cushman and Ellisor): 1a, Dorsal view of holotype (Cushman Coll. no. 15521); 1b, ventral view; and 1c, edge view (note: opening is fracture not aperture); 2a, dorsal view of hypotype (holotype of *Eponides alabamensis* Cushman and McGlamery, Cushman Coll. no. 23678); 2b, ventral view; 2c, edge view. Oligocene and L. Miocene?.

FIG. 3.—*Buccella hannai* (Phleger and Parker): 3a, Dorsal view of holotype (U.S.N.M. no. P 835); 3b, ventral view showing supplementary apertures at outer margin of suture; 3c, edge view. Recent, Gulf of Mexico.

FIGS. 4–6.—*Buccella frigida* (Cushman): 4a, Dorsal view of hypotype (holotype of *Eponides frigida* (Cushman), var. *calida* Cushman and Cole, Cushman Coll. no. 14213); 4b, ventral view; and 4c, edge view; 5, ventral view of weathered hypotype (Cushman Coll. no. 64505) showing position of supplementary apertures normally concealed by pustules; 6a, dorsal view of lectotype (Cushman Coll. no. 3032); 6b, ventral view; 6c, edge view. Late Tertiary to Recent.

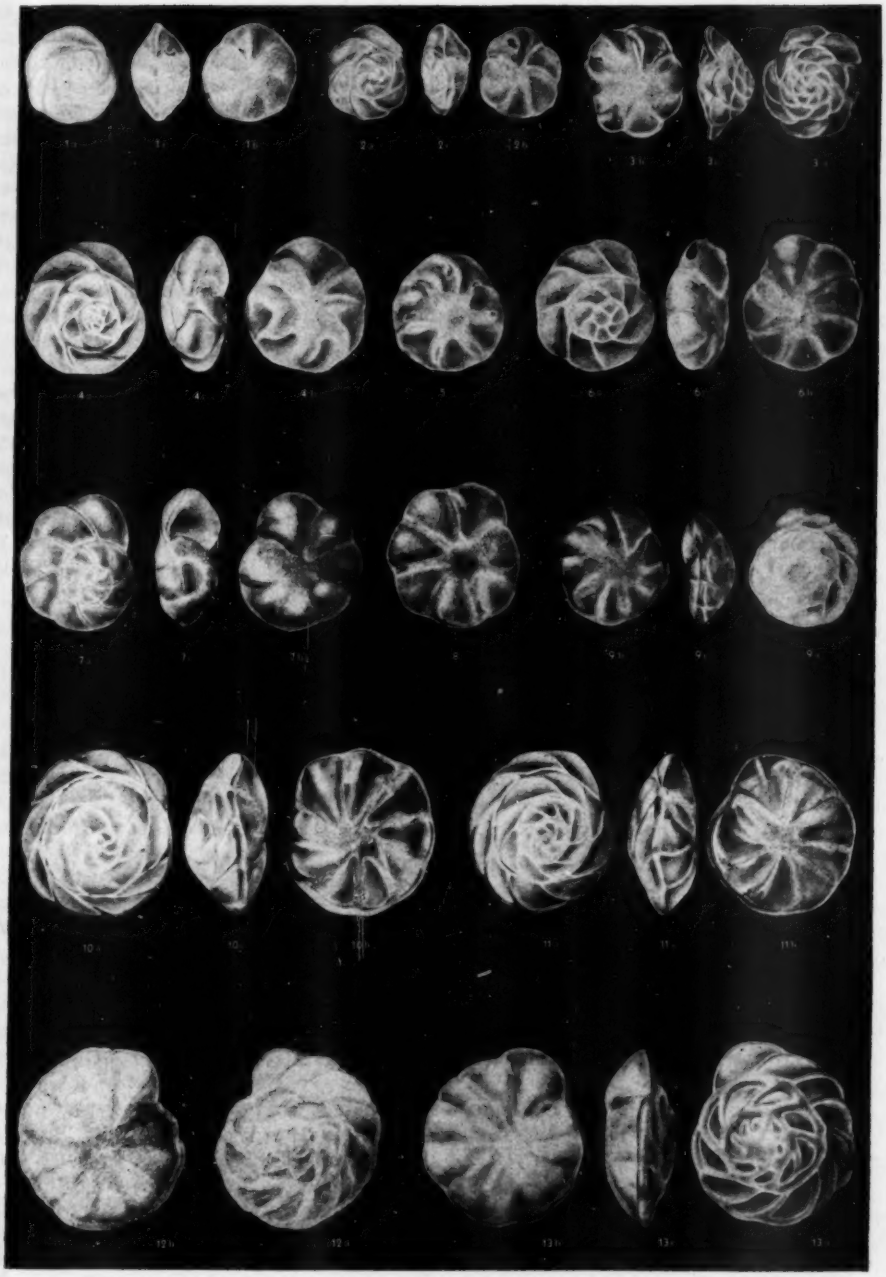
FIGS. 7, 8.—*Buccella depressa* Andersen, n. sp.: 7a, Dorsal view of holotype (U.S.N.M. no. P 833); 7b, ventral view; 7c, edge view; 8, ventral view of weathered paratype (U.S.N.M. no. P 834) showing position of supplementary apertures normally concealed by pustules. Recent.

FIG. 9.—*Buccella parkerae* Andersen, n. sp.: 9a, Dorsal view of holotype (Cushman Coll. no. 14582); 9b, ventral view; 9c, edge view. Miocene.

FIGS. 10, 11.—*Buccella inusitata* Andersen, n. sp.: 10a, Dorsal view of holotype (Cushman Coll. no. 64503); 10b, ventral view; 10c, edge view; 11a, dorsal view of paratype (Cushman Coll. no. 64504); 11b, ventral view; 11c, edge view. Recent.

FIGS. 12, 13.—*Buccella mansfieldi* (Cushman): 12a, Dorsal view of hypotype (Cushman Coll. no. 46507); 12b, ventral view; 12c, edge view; 13a, dorsal view of hypotype (Cushman Coll. no. 46506); 13b, ventral view; 13c, edge view. Miocene.

All magnifications ×50.



FIGS. 1–13.—(See opposite page for legend).

Buccella inusitata Andersen, n. sp.

Figs. 10a–c and 11a–c

Eponides frigidus (Cushman), Cushman and Todd, Cushman Lab. Foram. Res. Special Publ. **21:** 21 (Cushman Collection no. 48597 not figured). 1947.

Eponides peruvianus Cushman and Kellett (not d'Orbigny), Proc. U. S. Nat. Mus. **75** (art. 25): 10, pl. 4, figs. 5a–c. 1929.

Eponides frigidus (Cushman), Cushman, Cushman Lab. Foram. Res. Special Publ. **23:** 71, pl. 8, fig. 7. 1938.

Test of medium size; trochoid; dorsal and ventral sides equally biconvex in the microspheric form; megalospheric generation with the ventral side nearly flat and dorsal side extremely convex. Dorsal side with surface smooth, finely perforate and hyaline; and with slightly limbate sutures oriented strongly oblique to the peripheral margin and confluent with the periphery. Ventral side with surface rough and more coarsely perforate than the dorsal side; sutures depressed and radial; chambers slightly inflated, and with umbilicus, sutures, and basal margin of the last-formed chamber bearing a thick coating of pustulose material. Periphery acute and limbate, and with the last 2 or 3 chambers usually lobate. The number of chambers in the last-formed whorl ranges from 7 to 9, the most common being 9. Adult tests have 3 to 3¼ coils.

The only visible apertures are located on the ventral side of the test at the outer margin of each suture. In a slight depression near the periphery is a concentration of pustulose material through which are numerous, irregularly shaped openings. These openings eminate from the posterosutural margin of the younger (most recently added) chamber and from the anterosutural margin of the older (preceding) chamber.

The last-formed chamber when viewed from the interior has no well defined anterior aperture. Preceding chambers, however, have a well developed, narrow septal foramen interomarginally situated and numerous areal cribrate openings near the periphery which connect chambers in the same coil. One or two lateral foramen connect adjacent chambers of previous coils.

Dimensions of figured specimens: Holotype, maximum diameter 0.57 mm, maximum thickness 0.27 mm; paratype, maximum diameter 0.55 mm, maximum thickness 0.24 mm.

Remarks.—*Buccella inusitata* is characterized by its large test, by its acute and limbate periphery, by its limbate dorsal sutures, and by its supplementary apertures consisting of numerous irregularly shaped openings. It can be distinguished from *B. frigida* and *B. depressa* by its greater size and acute periphery; from *B. hannai* by its greater size and multiple openings in the outer portion of the ventral sutures; and from *B. mansfieldi* by its smaller size, lack of raised and limbate dorsal sutures, and greater development of pustulose material along the sutures. *B. inusitata* most closely resembles *B. oregonensis* from which it differs in having more inflated chambers on the ventral side of the test; less convexity in the umbilicus; and multiple supplementary apertures.

Types and occurrence.—Holotype (Cushman Collection no. 64503) and paratype (Cushman Collection no. 64504) from Dallas Bank, Straits of Juan de Fuca, station "A," coast of Washington. Unfigured paratypes (Cushman Collection no. 48597) from same locality as holotype. Station "A" refers to the list of stations in Special Publication 21 (Cushman and Todd, 1947).

Buccella mansfieldi (Cushman)

Figs. 12a, b and 13a–c

Eponides mansfieldi Cushman, Florida Geol. Surv. Bull. 4: 54, pl. 11, figs. 1a–c. 1930.

Emended diagnosis.—Test large for the genus; trochoid; biconvex, ranging from specimens with equal convexity on dorsal and ventral sides to specimens less convex on the ventral side. Dorsal side with surface finely perforate and hyaline (in well-preserved specimens); and with broadly limbate and raised sutures oriented oblique to the peripheral margin and confluent with the periphery. Ventral side with surface rough and more coarsely perforate than the dorsal side; sutures depressed and radial; chambers slightly inflated; and with the depressed umbilicus, sutures, and anterior, basal margin of the last-formed chamber bearing a coating of pustulose material (a few specimens have pustules covering the entire ventral side of the test). Periphery acute, broadly limbate, and lobulate. The number of chambers in the last whorl range from 9 to 12, the most common being 11. Adult test with 2¼ to 3 coils.

All apertures are concealed by pustulose material. When viewed from the interior, the adult chamber has an irregularly shaped opening at the

base and inner margin of the anterior wall, and a long, narrow slitlike opening at the base and outer margin of the posterior wall. This slitlike opening which, externally, would lie at the posteriosutural margin of the chamber, is so minute that it can not be discerned even in weathered specimens.

Comma-shaped, internal septal foramen connect adjacent chambers in the same coil; none appear to connect chamber in previous coils.

Dimensions of figured specimens: Hypotype (Fig. 12), maximum diameter 0.62 mm, maximum thickness 0.28 mm; hypotype (Fig. 13), maximum diameter 0.62 mm, maximum thickness 0.25 mm.

Remarks.—*Buccella mansfieldi* is larger, has a greater number of chambers, and has a more ornamented dorsal surface than any other species. It lacks the open supplementary apertures of *B. hannai* and *B. inusitata*. Even weathered specimens fail to exhibit supplementary apertures in the striking manner of some specimens of *B. frigida*, *B. depressa*, and *B. vicksburgensis*. The most evident characteristic of the genus *Buccella* exhibited by *B. mansfieldi* is the pustulose material coating the ventral side of the test.

Types and occurrence.—Hypotype, Fig. 12 (Cushman Collection no. 46507), is from the Choctawhatchee marl of John Anderson's farm, ¼ mile east of Red Bay, Walton County, Fla. It is from the same locality as the holotype (U.S.N.M. no. 371079), although it was not designated a paratype by Cushman. Hypotype, Fig. 13 (Cushman Collection no. 64506), is from the Miocene Choctawhatchee formation, Yoldia zone, Old Frazier farm, ¼ mile south of center of section 18, T. 2 N., R 19 W., Walton County, Fla.

Buccella oregonensis (Cushman, R. E. Stewart, and K. C. Stewart)

Eponides mansfieldi Cushman, var. *oregonensis* Cushman, Stewart, and Stewart, Oregon Dept. Geol. and Min., Ind. Bull. 36, (2): 43, pl. 6, fig. 4. 1947(1948).

Remarks.—The holotype of *B. oregonensis* (Cushman, Stewart, and Stewart) is the only representative of the species in the Cushman Collection. This constitutes an inadequate number of specimens upon which to base a study, and in this species it is particularly inadvisable since the final chamber of the holotype is broken. There is sufficient evidence, however, that the species belongs with the genus *Buccella*, and that there is no justification in continuing to consider it a variety of *B. mansfieldi*. *B. oregonensis* has neither the size nor dorsal ornamentation of *B. mansfieldi*. The species most similar to *B. oregonensis* is *B. inusitata*. Differentiation between the two is based on the more inflated chambers on the ventral side of the test, the less convex umbilicus and the multiple supplementary apertures of *B. inusitata*.

Types and occurrence.—Holotype (Cushman Collection no. 44208) from the Miocene shale of the Astoria formation, 700 feet southeast of Yaquina Head, Yaquina quadrangle, Oreg.

Buccella parkerae Andersen, n. sp.
Figs. 9a–c

Eponides mansfieldi Cushman, Cushman and Parker (not Cushman, 1930), Contr. Cushman Lab. Foram. Res. **7** (1): pl. 2, fig. 10a–c. 1931.

Test small; trochoid; biconvex, dorsal side nearly conoidal, ventral side with an umbilical flattening. Dorsal side with surface coarsely perforate; and with sutures of variable intensity; in the early coils concealed by a thin exogenous covering of shell material, in the last coil distinct, limbate, and in some specimens slightly raised above the surface of the test. Ventral side with surface coarsely perforate; depressed sutures radial near the umbilicus and abruptly curved backward at the peripheral margin; umbilicus depressed; and with umbilicus, sutures, and basal margin of the last-formed chamber bearing a coating of pustulose material, thickly deposited in the umbilicus, less densely deposited in the outer portion of the sutures. Periphery acute, limbate and slightly lobulate. The number of chambers in the last-formed whorl range from 9 to 11, 11 being the most common. Adult tests with 2½ to 3 coils.

The primary aperture is concealed by pustules. Supplementary apertures on the ventral side of the test are located in the slight depression at the outer margin of the suture near the periphery. Each aperture is a long, slitlike opening barely visible under high magnification.

When viewed from the interior, comma-shaped septal foramen connect chambers in the same coil.

Dimensions of figured holotype: maximum diameter 0.42 mm; maximum thickness 0.17 mm.

Remarks.—*Buccella parkerae*, originally identified as *Eponides mansfieldi* by Cushman and

Parker (1931b), has a superficial resemblance to the Florida species. It differs from *B. mansfieldi*, however, in its smaller size and less intensely ornamented dorsal surface. In *B. mansfieldi* the raised sutures on the dorsal side of the test are clearly defined from the proloculus to the periphery. In *B. parkerae* the proloculus and early coils of the dorsal spire are concealed by a thin coating of exogenous material that produces a low, conoidal capping in the center of the test. Only the last-formed coil or coil and half has distinct sutures with the barest indication being raised above the surface of the test.

Buccella parkerae can be distinguished from all other Pacific coast forms by the exogenous material on the dorsal side of the test. In addition, *B. parkerae* differs from *B. inusitata* by its raised dorsal sutures, smaller size, and more curved ventral sutures; from *B. depressa* by its acute periphery, limbate and raised dorsal sutures, and less depressed umbilicus; and from *B. oregonensis* by its smaller size, and depressed umbilicus.

Types and occurrence.—Holotype (Cushman Collection no. 14582), and unfigured paratypes (Cushman Collection no. 14583), from the Miocene, upper Tremblor formation, 1,500 feet west and 1,000 feet south of northeast corner of section 3, T. 28 S., R. 28 E., M.D.B.M., east side of San Joaquin Valley, Calif.

Buccella vicksburgensis (Cushman and Ellisor)

Figs. 1a–c, 2a–c

Eponides vicksburgensis Cushman and Ellisor, Contr. Cushman Lab. Foram. Res. **7** (3): 56, pl. 7, figs. 8a–c. 1931.
Eponides alabamensis Cushman and McGlamery, U. S. Geol. Surv. Prof. Paper 189-D: 110, pl. 27, fig. 2. 1938.
Eponides choctawensis Cushman and McGlamery, U. S. Geol. Surv. Prof. Paper 189-D: 110, pl. 27, fig. 1. 1938.

Emended diagnosis.—Test small, trochoid; biconvex, megalospheric forms with dorsal side strongly convex, microspheric forms with ventral side slightly flattened. Dorsal side with surface smooth, finely perforate and hyaline (in well-preserved specimens); and with limbate sutures oriented oblique to the peripheral margin and confluent with the limbate periphery. Ventral side with surface rough and more coarsely perforate than the dorsal side; sutures slightly depressed and slightly curved; and with chambers slightly inflated. Typical specimens have pustulose only on the sutures, umbilicus, and anterior basal margin of the last-formed chamber. Megalospheric forms have a slightly rounded periphery; microspheric forms have an acute, limbate and slightly lobulate periphery. The number of chambers in the last whorl range from 6 to 8, the most common being 7. Adult tests with 2½ coils.

All apertures are concealed by pustulose material. An occasional weathered specimen reveals the posterosutural apertures in slight depressions near the peripheral margin on the ventral side of the test. When viewed from the interior, the final chamber has an irregularly shaped opening at the base and inner margin of the anterior wall and a small arched opening at the base and outer margin of the posterior wall.

Also from the interior, comma-shaped septal foramen connect adjacent chambers in the same coil; and rounded septal foramen, laterally situated in each chamber connect adjacent chambers in previous coils.

Dimensions of figured specimens: Holotype, maximum diameter 0.33 mm, maximum thickness 0.20 mm. Hypotype (holotype for "*E. alabamensis*") maximum diameter 0.32 mm, maximum thickness 0.17 mm.

Remarks.—The factors which have a bearing on the placement of "*Eponides alabamensis*" and "*E. choctawensis*" in synonymy with *B. vicksburgensis* are: (1) Morphologic homogeneity noted in the actual specimens not discernible from the original descriptions and illustrations; and (2) the number of specimens of a species reported in the literature.

"*E.*" *vicksburgensis* and "*E. alabamensis*" were found to be incorrectly described and illustrated. In "*E.*" *vicksburgensis*, the opening at the base is a void produced by breakage not an aperture prepared by the animal; and the sutures on the ventral side of the test are more concealed by pustules than illustrated. In "*E. alabamensis*" the aperture is concealed by pustules, not open as illustrated and described; there are no costae across the sutures on the ventral side of the test as illustrated and described in the text; and the sutures on the ventral side of the test are more nearly concealed with pustules than illustrated. When purged of inaccuracies, the descriptions reflect the morphologic similarity apparent in the actual specimens. Additive proof of this morphologic similarity lies in an assemblage of specimens identified as *Eponides alabamensis* (Cushman Collection no. 25950) from the Chickasawhay marl near Millry, Ala. This assemblage

contains specimens with the thick coating of pustules on the ventral side of the test similar to the holotype of *"E." vicksburgensis*, and also specimens with the reduced pustulose coating on the ventral side of the test that characterizes the holotype of *"E. alabamensis."*

"Eponides choctawensis" has been reported three different times: Cushman and McGlamery, 1938; Cushman and McGlamery, 1942; and Cushman and Todd, 1946. In the last two reports the presence of the species in the sample is based on a single specimen. It is even possible that the holotype is based on a single specimen since there are no paratypes in the Cushman Collection. In addition to the limited number of specimens available of *"E. choctawensis,"* it is also significant to note that *"E. choctawensis"* has been reported only from samples in which *"E. alabamensis"* (*B. vicksburgensis*) is also present and well represented by a number of specimens. The conclusion drawn is that *"E. choctawensis"* probably represents a varient or phase in the life cycle of *B. vicksburgensis* and therefore does not warrant a separate specific name. An analogy can be drawn with *B. hannai* in which a small, rare form with more inflated chambers and a more lobulate and rounded periphery than the typical form is accepted in the species (Phleger and Parker, 1951).

The typical specimen of *B. vicksburgensis* is easily distinguished from any other species of *Buccella* by its thick pustulose coating on the ventral side of the test. In comparison with other Atlantic and Gulf Coast forms and in addition to the above characteristic, it can be differentiated from B. mansfieldi by its smaller size, and lack of ornamentation of the dorsal sutures; from *B. frigida* by its acute periphery; and from *B. hannai* by its lack of open supplementary apertures, and less lobate periphery.

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MAMMALOGY.—*A new pine mouse* (Pitymys pinetorum carbonarius) *from the southern Appalachian Mountains.*[1] CHARLES O. HANDLEY, JR., U. S. National Museum. (Communicated by H. W. Setzer.)

As long ago as 1900 Vernon Bailey noticed that the pine mouse (*Pitymys pinetorum*) of the Cumberland Plateau region of the southeastern United States differed in important respects from other populations farther to the south and southwest. In his *Revision of American voles of the genus* Microtus, North American Fauna no. 17: 65. 1900, he remarked that: "A series of 31 specimens in the Merriam collection from Eubank, Ky., average darker and richer in coloration than the type series [referring to *P. p. auricularis*], and have equally large ears." Lacking material from other Cumberland localities, he called the Eubank mice *auricularis*. Later, Hooper and Cady (Journ. Mamm. **22:** 325. 1941) discovered the same characters in specimens from Cleveland, Virginia, on the eastern fringe of the plateau region, but referred their specimens to *P. p. scalopsoides*. Sufficient material is now available to show that the pine mouse of the Cumberland Plateau is quite distinct from surrounding populations. With regard for its habitation of a region particularly noted for coal, I have named it:

Fitymys pinetorum carbonarius, n. subsp.

Type.—Old adult female in slightly worn winter pelage; skin and skull; U. S. N. M. no. 191204; collected February 14, 1888, at Eubank, Pulaski County, Ky., by John B. Lewis; original number 76.

Distribution.—The Austral and Transition Life Zones of southwestern Virginia, northeastern Tennessee, eastern Kentucky, extreme southeastern Ohio, and probably southern West Virginia (east to Russell County, Va., and Carter County, Tenn.; south to Jefferson and Campbell Counties, Tenn.; west to Pulaski County, Ky.; and north to Lawrence County, Ohio).

Description.—Type (capitalized color terms from Ridgway, 1912, *Color standards and color nomenclature*): Dorsum between Sanford's Brown and Argus Brown, overlaid with black; flanks, shoulders, cheeks, and sides of snout between Amber Brown and Tawny; belly and legs silvery gray, washed with buff; upper surfaces of feet Hay's Brown with a silvery cast; tail brownish above, darker than feet, whitish below, with no clear line of demarcation between the colors. Size large; ears not completely concealed by fur. Skull of light construction, somewhat angular, not noticeably convex in dorsal profile; postorbital protuberance of squamosal slightly developed; zygomatic arches light and parallel to one another; rostrum long and narrow; braincase long and wide; incisive foramina long and frequently narrowed posteriorly; and anterior margin of mesopterygoid fossa variable in outline, either U-shaped or V-shaped.

Measurements (in millimeters; average followed by extremes).—Ten adults (both sexes; including type) from Eubank, Ky.: Skin—total length, 125 (118–139); tail, 23 (19–26); hind foot, (no measurements available). Skull—greatest length, 25.6 (25.1–26.6); zygomatic breadth, 15.5 (14.9–16.6); least interorbital width, 4.4 (4.1–4.6); nasal length (along mid-line), 7.8 (7.7–8.0); maxillary molar series (alveolar length), 6.4 (6.2–6.7); mastoidal breadth, 13.0 (12.3–13.6); braincase length (dorsal midpoint of foramen magnum to postorbital process of squamosal), 13.3 (13.0–13.6).

Comparisons.—This race is characterized in all pelages by dark and bright coloration of the dorsum, a consequence of the combination of black overlay and dark hue of the subapical band. It is the darkest known American population of *Pitymys*. Cranially it does not appear to be well differentiated; observed variations from other races are only average and are of small magnitude. With respect to the cranium, its closest relatives seem to be *P. p. auricularis* and *P. p. scalopsoides*. In many ways it is intermediate between these two forms. Resemblances to *P. p. pinetorum* are fewer. Geographically remote *P. p. nemoralis* and *P. parvulus* need not be considered in this discussion.

From *scalopsoides* the race *carbonarius* may be distinguished by much darker, brighter coloration of the dorsum, a greater amount of black on the tips of the dorsal guard hairs, less angular skull, less well developed postorbital protuberance of the squamosal, lighter zygomata, longer rostrum, wider braincase, longer incisive foramina

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with a greater tendency toward posterior constriction.

The subspecies *auricularis* is nearly as dark as *carbonarius*, but the latter is brighter and has a more angular skull with a less convex dorsal profile, lighter and more parallel zygomata, longer and narrower rostrum, wider braincase, incisive foramina more frequently constricted posteriorly, and the anterior margin of the mesopterygoid fossa less constantly U-shaped.

In brightness, but not in darkness, *carbonarius* is approached by *pinetorum*. However, *carbonarius* has more black on the dorsal guard hairs, and has the subapical band of a darker, more intense color. Further, it is larger in all dimensions, and has the skull more angular and less convex in dorsal profile, the rostrum longer and narrower, the braincase longer and wider, the incisive foramina longer and more frequently constricted posteriorly, the anterior margin of the mesopterygoid fossa not so consistently V-shaped, and the auditory bullae more inflated and more pointed anteriorly.

Remarks.—Probably the characters of *carbonarius* are best developed in the Cumberland Mountains and adjacent plateau. In outlining the geographic range of this race, two areas have given particular difficulty: The Ohio Valley in the longitude of Ohio and the northeastern portion of the Tennessee River watershed. These are areas where the characters of several races of *Pitymys pinetorum* merge.

Bascom, Ind., is the easternmost locality along the Ohio River from which typical *auricularis* has been seen. Specimens from Brookville, Ind., are intermediate and nearer *scalopsoides*, while ones from Ripley, Ohio, are intermediate and nearer *auricularis*. Farther upstream, at Rome and Smokey Creek, Adams County, Ohio, material is again intermediate, but nearer *scalopsoides*. Still farther eastward, where the Ohio River swings nearest to the range of *carbonarius*, at Lawrence County, Ohio, the darkest Ohio *Pitymys* are to be found. These are like *auricularis*, but in view of the character of the specimens from localities down stream, nearer the center of the range of *auricularis*, I tentatively consider the scanty Lawrence County material to be intergrades between *scalopsoides* and *carbonarius*, but nearer the latter. The character of dark coloration may be traced farther northeastward in the Ohio Valley to Belmont County, Ohio. Bole and Moulthrop (Sci. Publ. Cleveland Mus. Nat. Hist. **5**: 161. 1942) identified specimens from Cat Run in this county as *pinetorum*. I have examined material from Cat Run and find it only slightly darker than typical *scalopsoides* from southeastern New York. It can be referred without hesitation to *scalopsoides*.

In the Tennessee Valley, specimens from Cleveland, Va., are intermediate between *scalopsoides* and *carbonarius*, but nearer the latter. A single individual from Watauga Valley, Tenn., is referred to *carbonarius*, although it is paler than that race and shows intergradation toward *pinetorum* or *scalopsoides*. A series from Marshall, N. C., is somewhat darker than typical *pinetorum*, showing the influence of either *carbonarius* or *auricularis*, both of which are darker than *pinetorum*.

Specimens examined.—Specimens are in the U. S. National Museum or the U. S. National Museum, Biological Surveys collection, except as indicated by the following abbreviations: CMNH—Cleveland Museum of Natural History; CM—Charleston [S. C.] Museum; CU—Cornell University; MGFC—Mississippi Game and Fish Commission; UMMZ—University of Michigan Museum of Zoology. I am grateful to the authorities at these institutions for the loan of specimens.

P. p. auricularis.—INDIANA: Bascom, 5; Worthington, 1. KENTUCKY: Canmer, 2; Monticello, 1. MISSISSIPPI: Copiah County, 2 (MGFC); Jones County, 1 (MGFC); Lincoln County, 2 (MGFC); Rankin County, 1 (MGFC); Washington, 4. NORTH CAROLINA: Cherokee County, 1 (UMMZ). OHIO: Ripley, 4 (CMNH). TENNESSEE: La Follette, 1.

P. p. carbonarius.—KENTUCKY: Eubank, 31; Quicksand, 1 (CU). OHIO: Hanging Rock, 1 (UMMZ); Symes Creek, Lawrence County, 1 (CMNH). TENNESSEE: High Cliff, 2; Jefferson County, 2 (CMNH); Watauga Valley, 1. VIRGINIA: Cleveland, 2 (UMMZ); Hurricane, Wise County, 6.

P. p. pinetorum.—NORTH CAROLINA: Bent Creek Experiment Station, Pisgah National Forest, 1; Madison County, 1 (CM); Marshall, 9 (CMNH). SOUTH CAROLINA: Abbeville, 1 (CM); Charleston, 5 (CM); Clemson College, 3 (CM); Frogmore, 1; Georgetown, 1 (CM); Summerville, 1 (CM).

P. p. scalopsoides.—INDIANA: Brookville, 3. NEW YORK: Suffolk County, 3; Ulster County, 7. OHIO: Cat Run, Belmont County, 15 (CMNH); Rome, Adams County, 7 (CMNH); Smokey Creek, Adams County, 1 (CMNH). VIRGINIA: Blacksburg, 2. WEST VIRGINIA: Gilboa, 2; Raymond City, 1; White Sulphur Springs, 11.

MALACOLOGY.—*Nomenclatural review of genera and subgenera of Chamidae.*

DAVID NICOL,[1] U. S. National Museum.

Except for the excellent paper by Odhner (1919), which has not been carefully studied by most other workers, little research in systematics has been done on the Chamidae. Genera and species of this interesting pelecypod family have, in general, not been understood. Before giving a description of the family, it is necessary to point out the principal weakness of a nomenclatural review. There is always the possibility that one or more genera will be incorrectly allocated because the descriptions and figures are unrecognizable. The problem of inadequate descriptions and figures can be solved only by examining specimens of the type species.

The Chamidae have a porcellaneous shell which may have either concentric or radial ribs, and the shell may be spinose, nodulose, or smooth. The inner ventral border may be smooth or may have small crenulations. A sulcus is commonly present at the posterior fifth of the shell. It runs from the umbos to the posterior ventral border. The shell may be attached by either valve (more commonly the left one) to the substrate during a small part of or practically all of its life. The valves may be markedly unequal or only slightly so, but the attached valve is always the larger. There is no gape for the byssus, foot, or siphons. With the exception of *Echinochama*, which has a lunule, neither a lunule nor an escutcheon is present. The beaks are prosogyrate and are placed in front of the parivincular ligament. This structure is external but commonly sunken. The pallial line is integripalliate, with a small indentation where it joins the posterior adductor muscle scar. In some species the pallial line joins the anterior adductor muscle scar not at the ventral margin but along the anterior margin. The anterior adductor muscle scar commonly abuts the anterior margin of the hinge plate. The adductor muscle scars are large and either elongate or ovate. The pallial line and adductor muscles commonly resemble those of the lucinids. The hinge teeth in adult shells have been greatly modified by the torsion of the beaks and secondary splitting, and there is little agreement as to the number of cardinal and lateral teeth in each valve. However, the basic pattern appears to be like that of a highly modified lucinoid hinge. One large cardinal tooth is present in each valve. In the attached valve, particularly in *Echinochama*, a much smaller cardinal tooth is located above and posterior to the large cardinal tooth. A small conical posterior lateral tooth is sometimes seen on the attached valve.

The following genera and subgenera are chamids, with type species whose morph ologi characters correspond to those of the family, and whose names are nomenclaturally valid. This does not mean that all will be acceptable when careful work on the classification of the Chamidae is completed, but these names form a basis for future taxonomic work on the family.

Chama Linné, 1758, pp. 691,692. Type species (subsequent designation, Schumacher, 1817, pp. 20,123. See also Stewart, 1930, p. 33) *Chama gryphoides* Linné, 1758, Recent; Mediterranean Sea. Figd., Bucquoy, Dautzenberg, & Dollfus, 1892, pl. 50, figs. 1–4.

Ciplyella Vincent, 1930, pp. 111,112. Type species (original designation)—*Chama pulchra* Ravn, 1902, Danian, Paleocene; Denmark, Belgium. Figd., Vincent, 1930, pl. 6, fig. 12. *Ciplyella* is probably a chamid, although a careful study of the type species is necessary to ascertain this.

Echinochama Fischer, 1887, p. 1049. Type species (monotypy)—*Chama arcinella* Linné, 1767, Recent; West Indies. Figd., Reeve, 1847, vol. 4, *Chama* species 26, pl. 5, fig. 26a.

Eopseuma Odhner, 1919, pp. 25,75. Type species (monotypy)—*Pseudochama* (*Eopseuma*) *pusilla* Odhner, 1919, Recent; Strait of Macassar. Figd., Odhner, 1919, figs. 20–27.

Maceris Modeer, 1793, pp. 174,182. Type species (subsequent designation, Winckworth, 1935, p. 322)—*Chama lazarus* Linné, 1758, Recent; East Indies. Two species were referred to in the discussion of the genus *Maceris* (p. 182)—*Chama gryphus* Linné and *Chama lazarus* Linné. It is not certain whether Modeer meant *Chama gryphoides* Linné or *Anomia gryphus* Linné for the first species. Figd., Reeve, 1847, vol. 4, *Chama* species 4, pl. 2, figs. 4a, b.

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Pseudochama Odhner, 1917, pp. 28–34. Type species (subsequent designation, Prashad, 1932, p. 295)—*Chama cristella* Lamarck, 1819, p. 96, Recent; East Indies. *Chama cristella* has been considered the type species of *Pseudochama* by original designation and by monotypy. Neither of these ideas is correct. Odhner mentioned other species as belonging to *Pseudochama* in his original discussion of the genus. Figd., Reeve, 1847, vol. 4, *Chama* species 42, pl. 8, fig. 42.

The following generic and subgeneric names have been associated with the Chamidae in the past, but all of them appear to be unavailable from the evidence thus far obtained.

Arcinella Schumacher, 1817, pp. 47,142. Type species (monotypy)—*Arcinella spinosa* Schumacher, 1817 = *Chama arcinella* Linné, 1767. A homonym of *Arcinella* Oken, 1815, which is a carditid genus.

Camelaea Herrmannsen, 1852, vol. 2 (supplement), p. 23. A genus without species. Herrmannsen refers to a work by P. F. Gmelin which has been rejected by the International Commission of Zoological Nomenclature, Opinion 123.

Cameola Rafinesque, 1815, p. 148. An emendation of the name *Chama* Linné, 1758.

Camostraea Deshayes, 1830, p. 178. A genus without species. Also a misinterpretation of Blainville's definition of the genus.

Chamigenus Renier, 1807, p. vii. Original reference not seen. Renier's names ending in *genus* have not been accepted by malacologists. For a good review of the problem, see Keen, 1951, pp. 8–15.

Chamites Gmelin, 1793, p. 402. The name *Chamites* is listed as a species under the genus *Helmintholithus*. Neave (1939, p. 668) and Schulze (1927, p. 630) are in error in considering *Chamites* of Gmelin as a generic name.

Cipleyella Neave, 1939, vol. 1, p. 740. Error for *Ciplyella* Vincent, 1930.

Diceratia Oken, 1815, p. 829. Type species (monotypy)—*Chama cor* Linné, 1767. *Diceratia* appears to be a synonym of *Isocardia* Lamarck, 1799, and *Glossus* Poli, 1795.

Diceratis Paetel, 1875, p. 69. Error for *Diceratia* Oken, 1815.

Globus Deshayes, 1832, p. 170. A genus without species and a homonym of *Globus* Scopoli, 1772.

Goossensia Cossmann, 1885, p. 113. Type species (monotypy)—*Goossensia plicatuloides* Cossmann, 1885, pp. 113–115. Probably not a chamid; however, Dall's opinion (1903, p. 1397) that the genus is based on a nepionic shell of a chamid is certainly worthy of investigation.

Gryphus Gray, 1847, p. 193. A genus without species. This name is listed under *Chama* and *Arcinella* and credited to Humphrey, as a manuscript name. A homonym of *Gryphus* Megerle, 1811, *Gryphus* Oken, 1816, among others.

Hellia Schafhäutl, 1863, pp. 160,161. Type species (monotypy)—*Hellia gryphus* Schäfhautl, 1863. This species has been described from poorly preserved internal casts, but it probably does not belong to the family Chamidae. The right valve is supposedly larger than the left.

Jataronus Bruguière, 1792, p. 546. A genus without species. It is impossible, from the brief description, to define the genus.

Lacinea Sowerby, 1842, p. 168. A genus without species. Listed as a synonym of *Chama* Lamarck.

Lazarus Cuvier, 1800, table 5. A nomen nudum.

Licinia Gray, 1847, p. 193. A genus without species. This name is listed under *Chama* and *Arcinella* by Gray and credited to Humphrey, 1797, as *Licinia* sp. A homonym of *Licinia* Swainson, 1820.

Macerophylla Mörch, 1853, p. 36. A genus without species. Listed as a manuscript name of Martens.

Macerophyllum Herrmannsen, 1847, vol. 2, p. 1. A genus without species.

Macrophyllum Gray, 1847, p. 193. A genus without species. Also a homonym of *Macrophyllum* Gray, 1838.

Psiloderma Fischer, 1887, p. 1048. Error for *Psilopoderma* Poli, 1795.

Psilopoderma Poli, 1795, pp. 253,258. Type species (monotypy)—*Chama gryphoides* Linné, 1758. A synonym of *Psilopus* Poli, 1795, and of *Chama* Linné, 1758.

Psilopododerma Agassiz, 1846, p. 313. Emendation of *Psilopoderma* Poli, 1795.

Psilopus Poli, 1795, p. 112. Type species (monotypy)—*Chama gryphoides* Linné, 1758. A synonym of *Chama* Linné, 1758.

Psilotus Rafinesque, p. 146. An error for *Psilopus* Poli, 1795.

Stola Herrmannsen, 1849, vol. 2, p. 503. A genus without species.

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ENTOMOLOGY.—*A new carpenterworm from Florida (Lepidoptera: Cossidae)*.

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It is seldom that so large and conspicuous a moth as that described below remains undiscovered for so long a time, especially since it inhabits a well-populated area and a region frequented by entomologists. Nevertheless such is the case, and it is a further example of what yet remains to be done in many parts of the country. The larvae of this species were first reported by William Reimer, a medical student, and the type series was reared and submitted by Prof. H. F. Strohecker, Department of Zoology, University of Miami.

Prionoxystus baccharidis, n. sp.

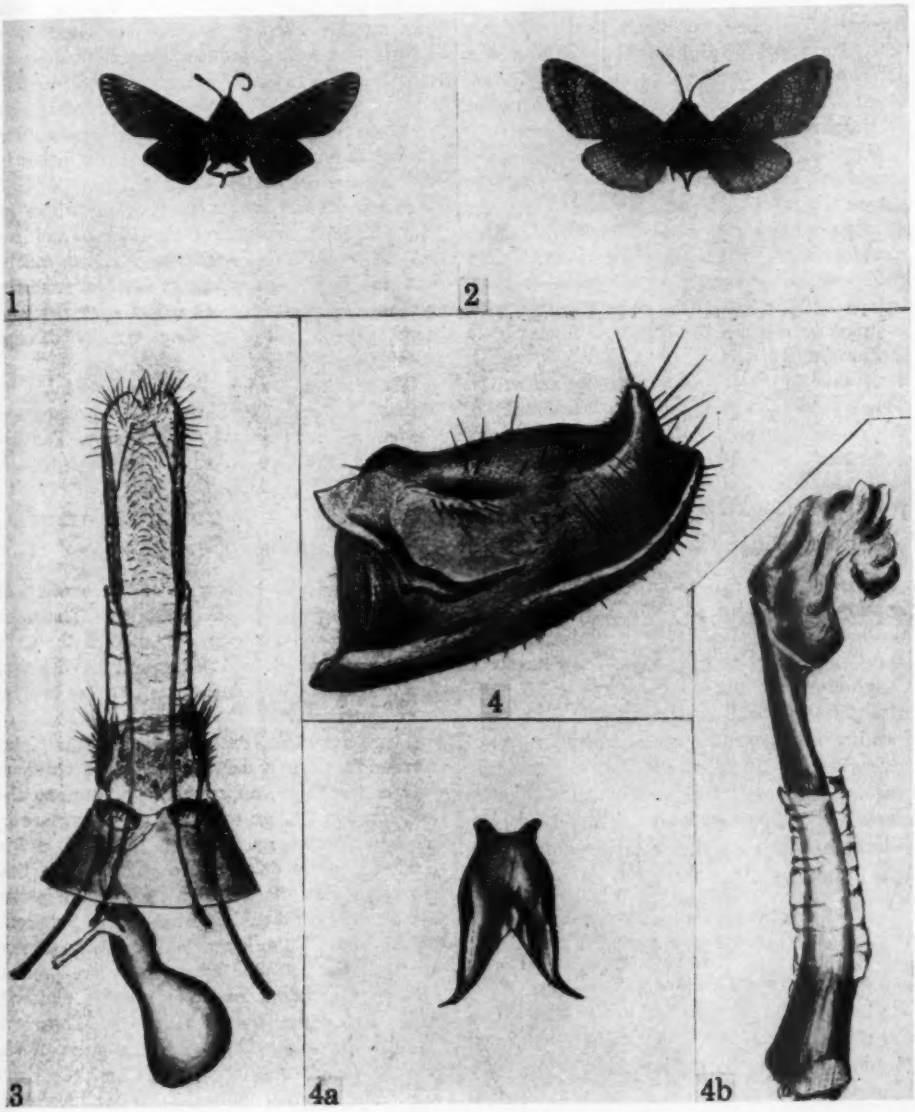
Figs. 1–4b

Alar expanse: Male, 34–40 mm. Female, 43–45 mm.

Antenna black with strong, metallic-blue iridescence above. Labial palpus, head, thorax, and ground color of forewing sordid white to cinereous, the lighter color prevailing in the female; palpus, head, and thorax with dark-gray and black scales mixed; forewing covered with a fine, black reticulum somewhat heavier in male than in female; costal black markings

exhibiting much metallic-blue iridescence; hindwing of male blackish fuscous except black-marked cinereous costa; hindwing of female pale cinereous with fine, somewhat obscured reticulum. Legs cinereous, banded with black, the latter color with strong, metallic-blue irridescence. Abdomen cinereous, strongly irrorate with black and dark gray, and grayish fuscous above in male.

Male genitalia.—Symmetrical. Uncus broad, triangular. Lateral elements of gnathos broadly fused distally, flattened. Harpe, anellus, and aedeagus as figured; clasper arising at base of harpe with distal end free.



FIGS. 1–4b.—*Prionoxystus baccharidis*, n. sp.: 1, Male; 2, female; 3, ventral view of female genitalia; 4, right harpe; 4a, anellus; 4b, aedeagus.

Female genitalia.—As figured.

Type.—U.S.N.M. no. 61307.

Type locality.—Coral Gables, Dade County, Fla.

Food plant.—*Baccharis* sp.

Remarks.—Described from the type male and three male and two female paratypes from the type locality, all reared by Prof. H. F. Strohecker. All bear emergence dates of March 1951. Paratypes in the U. S. National Museum; Department of Zoology, University of Miami, Coral Gables, Fla.; and the British Museum (Natural History).

Previously the genus *Prionoxystus* was represented in North America by only two described species, *P. robiniae* (Peck) (carpenterworm) and *P. macmurtrei* (little carpenterworm). *P. baccharidis*, for which I suggest the common name "saltbush carpenterworm," is nearest *robiniae*, but is smaller, and the yellow hindwing of *robiniae* is replaced by the dark hindwing in *baccharidis*.

Of this species Professor Strohecker writes: "The specimens were bred from the trunks of the *Baccharis*. Roy Woodbury, of our botany department, tells me that the stand of *Baccharis* from which I cut the pieces includes (my memory) four species . . . The larvae occur most frequently in the bole near ground level but some of them were found in branches not much more than an inch in diameter. All the wood cut by me was from living bushes.

"The exact locality was an area near what is known locally as 'Tahiti Beach.' The mangrove growth near the bay is followed inland by a growth of saltbush. I don't know the history of this place, i. e., whether the saltbush is a 'natural' stand or sprang up after removal of such plants as white mangrove and buttonwood. Some of the *Baccharis* have trunks three or more inches in diameter but all are of low height.

"Last March I went to the site where he [Mr. Reimer] had found the larvae and cut several bushes. Those with large larvae can be detected by the exudations of sawdust from the borings. The little insects are of such powerful flight when adult that they quickly damage themselves in a cage."

The photographs for this paper were taken by Robert Bonde, of the U. S. Department of Agriculture. Drawings by the author. The figures are of the type male and a paratype female.

PALEONTOLOGY.—*Two new species of* Sinclairocystis. HARRELL L. STRIMPLE, Bartlesville, Okla. (Communicated by Alfred R. Loeblich, Jr.)

Subsequent to the finding of *Sinclariocystis* Bassler (1950), by Dr. G. A. Cooper and William Allen, of the U. S. National Museum, in Ordovician rocks of southeastern Oklahoma, the author and his wife, Mrs. Melba Strimple, have collected at the type locality on several occasions and have found several interesting forms of the "Cystoidea." Among these are two new species of *Sinclairocystis* described below. They lend considerable additional information concerning this unique genus.

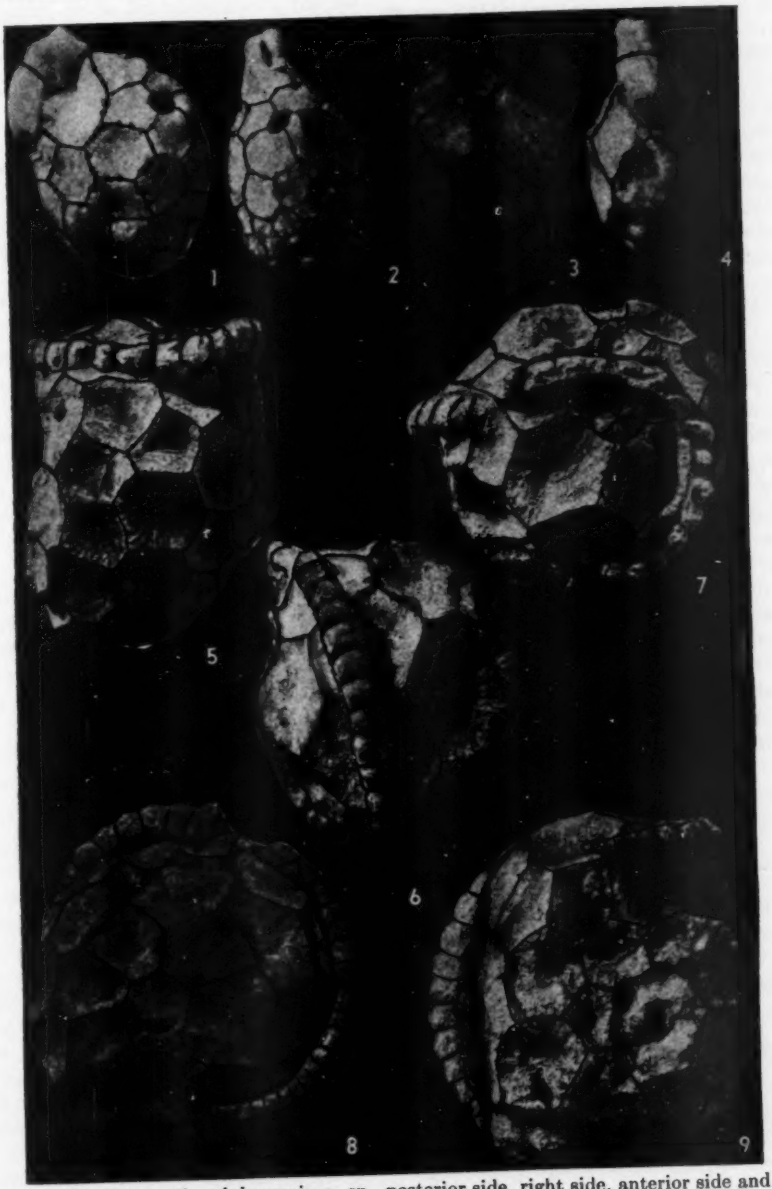
Sinclairocystis angulatus, n. sp.
Fig. 5-9

Two recumbent arms are present, that to the left terminating near the columnar attachment, the right passing closely behind the anus and forming a loop to the posterior about the large posterior thecal plates and terminating high on the theca. On the antanal side of the left arm, food grooves are seen passing from the facets for the brachioles to a more or less continuous groove along the length of the arm. The same process is present on the anal side of the right arm. One brachiole facet is present on each arm segment and no covering plates over the grooves have been observed.

There are three basal plates and four plates surrounding the anus. In the anal (posterior) side of the theca, an angulation occurs to the left, forming a more or less flattened surface in what might be termed the left posterior, and is bordered to the left by the left arm. In this restricted area there are only two large plates between the basal circlet and the plates adjacent to the anus. In the lateral wall of the posterior thecal plates are small, with four or five present between the basals and the summit platform which is bordered by the right arm. The right lateral side of the theca has two series of six small plates between the basals and the right arm. The antanal (anterior) is composed of slightly larger plates than those of the right side and considerably larger plates as the left arm

bearing ray is approached. In the first mentioned area, four or five plates are present between basals and those plates adjoining the anus and in the latter area only three. The left arm-bearing ray is composed of three large and two small plates, including the basal and summit plates.

The anal opening is covered by a low pyramid-like circlet of five triangular shaped plates. What



FIGS. 1–4.—*Sinclairocystis sulphurensis*, n. sp., posterior side, right side, anterior side and left side, X 4; FIGS. 5–9.—*Sinclairocystis angulatus*, n. sp., right side, left side, top view, anterior side and posterior side, × 2.5.

appears to be a small opening (hydropore?) occurs in the median portion of the first plate below the mouth on the antanal side of the theca and is marked by a tubercle like projection.

Most thecal plates are hexagonal, but several have five sides and a few have as many as seven sides. All except those of the anal pyramid have strongly depressed median sections and are marked by fine grooves, which are perpendicular to the sides of the plates. There is indication that near the sutures some grooves penetrate the theca. Granular ornamentation is present on all thecal plates except those of the anal pyramid.

Measurements of the holotype are as follows: Maximum height of theca (including arms), 20.2 mm; maximum width, 19.1 mm; diameter of anus, 2.5 mm; length of left arm, 24.6 mm; length of right arm, 28.2 mm.

Remarks.—*S. angulatus* is readily separable from *S. praedecta* Bassler (1950) in possession of more numerous thecal plates, a different shape to the theca, and the distinctive attitude of the right arm in the former species. In *S. praedecta*, the right arm curves down the right side of the theca with only slight curvature toward the posterior. In the present species the right arm forms an uncompleted circular loop, terminating high on the theca in posterior position. *S. sulphurensis* has the same arm placement as *S. praedecta* but differs in several respects from either species.

Occurrence.—Blackriverian (Bromide formation, near top of green shale), 1.8 miles south of Sulphur, Okla.

Holotype.—Collected by the author. To be deposited in the U. S. National Museum.

Sinclairocystis sulphurensis, n. sp.
Figs. 1–4

Theca is small, rotund in outline. A portion of the left arm is preserved which shows the proportionately large nature of these appendages. Most thecal plates are hexagonal but several have from five to seven sides. The larger plates are in the anterior where only two or three plates are interposed between the basals and the four plates adjoining the anus. Median portions of the thecal plates are shallowly depressed and round holes mark the sutures, particularly in the posterior and right sides of the theca. No ornamentation is present.

Measurements of the holotype are as follows: Maximum height of theca (including arm), 10.2 mm; maximum width of theca (excluding arms), 6.7 mm; diameter of anal opening, 1.2 mm.

Remarks.—*S. sulphurensis* differs from *S. angulatus* and *S. praedecta* in outline of theca, small size, and lack of ornamentation. The small number of thecal plates and the attitude of the arms indicates closer affinity to *S. praedecta* than to *S. angulatus*. The openings into the body cavity found along the sutures are not so numerous and have a circular outline as compared to the innumerable openings along the sutures of *S. praedecta*, which have rectangular outlines.

Occurrence.—Blackriverian (Bromide formation, near top of green shale), 1.8 miles south of Sulphur, Okla.

Holotype.—Collected by Mrs. Melba Strimple. To be deposited in the U. S. National Museum.

BOTANY.—*A new* Nymphoides *from Colombia.*[1] LYMAN B. SMITH, U. S. National Museum.

The present species is one of many recent novelties which indicate that the flora of the eastern Llanos of Colombia is still poorly known in spite of a great increase in collections by local and foreign botanists.

Nymphoides flaccida L. B. Smith, sp. nov.
Fig. 1

Foliorum laminis oblongis, basi cuneatis bis cordatis, flaccidis; corolla alba, lobis fimbriatis.

Plant submersed; stems elongate, 2.5 mm in diameter, bearing one to several leaves and a cluster of flowers at the apex; petioles from very short on the largest leaves to 6 cm long on some of the smaller ones; blades oblong, slightly broader toward the cuneate to cordate base, broadly obtuse, flaccid with repand margins, 8 cm long, 2.5 cm wide, glandular; pedicels slender, 7 cm long, naked, glabrous; sepals linear, 6 mm long; corolla white, over 2 cm in diameter, its lobes long-fimbriate; fruit unknown.

Type in the Herbaric Nacional Colombiano, collected in the Caño Quenane, eastern Llanos, Territory of Meta, Colombia, January 25, 1942, by A. Dugand and R. Jaramilio M. (no. 3121).

[1] Published by permission of the Secretary of the Smithsonian Institution.

Additional specimen examined: COLOMBIA: Meta: In the Caño de Peralonso, vicinity of Villavicensio, eastern Llanos, alt. 450 m, July 24–28, 1946, *Jaramillo, Mesa, Idrobo, & Fernández* 362 (US).

The flowers of *Nymphoides flaccida* are much like those of *N. humboldtiana* (H.B.K.) Kuntze, but the great contrast in their leaves without any intermediate variation makes it seem fairly certain that they are distinct.

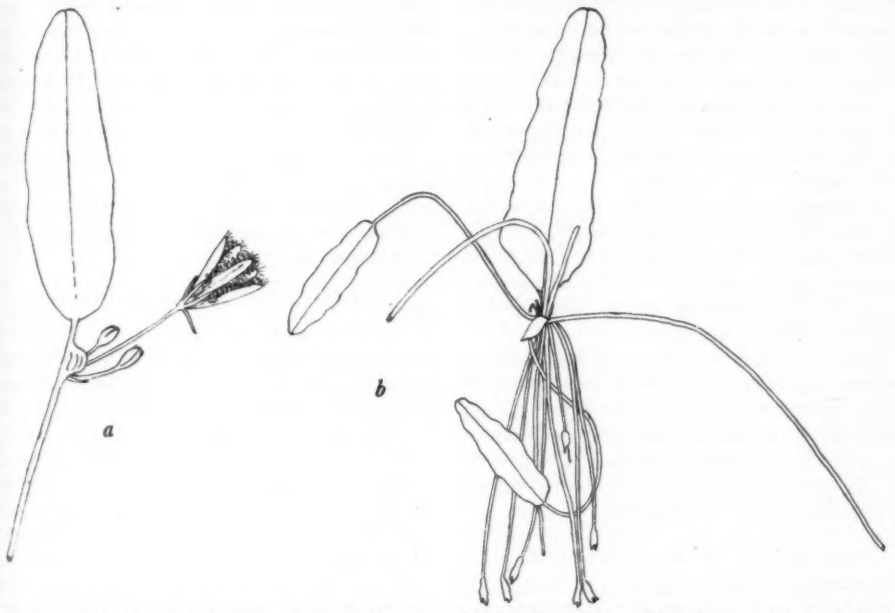


FIG. 1.—*Nymphoides flaccida*: *a*. Part of the type showing the only complete flower, ×1; *b*, part of *Jaramillo et al.* 362 showing variation of leaves and a well-developed umbel, ×½.

PROCEEDINGS OF THE ACADEMY

445TH MEETING OF BOARD OF MANAGERS

The 445th meeting of the Board of Managers, held in the Cosmos Club on March 12, 1951, was called to order at 8:04 p.m. by the President, NATHAN R. SMITH. Also present were: W. RAMBERG, H. S. RAPPLEYE, J. A. STEVENSON, W. F. FOSHAG, A. T. MCPHERSON, C. F. W. MUESEBECK, SARA E. BRANHAM, E. U. CONDON, W. R. WEDEL, L. H. ADAMS, E. H. WALKER, W. A. DAYTON, C. A. BETTS, L. A. SPINDLER, A. M. GRIFFIN, H. W. HEMPLE, F. M. DEFANDORF, and, by invitation, MARGARET PITTMAN, J. R. SWALLEN, and G. P. WALTON.

A letter of resignation from the Chairman of the Committee on Membership, L. A. SPINDLER, was read. The following report of the Committee on the Encouragement of Science Talent was read and approved:

This Committee judged the papers submitted from the District of Columbia schools in the Tenth Science Talent Search conducted by the Science Clubs of America. The following were selected for recommendation as winners:

PAUL E. CONDON—Paper 920—Iron-Type Chemical Heaters

CECILIA GREEN—Paper 1600—Potential Difference in a Conducting Solution

DONALD L. MILLER—Paper 1698—Observation of Meteors

JOSEPH M. CALDWELL, *Acting Chairman*

The President read a letter from W. N. FENTON, Chairman of the Committee on the Index of the Journal, recommending appointment of a committee to consider and implement publication of the index as prepared in card index form by Mary A. Bradley. The Board voted that the President appoint a Committee on Ways and Means of Publishing the Index.

The Board elected MARTIN A. MASON to be Vice-President of the Academy representing the District of Columbia Section of the American Society of Civil Engineers following the reading of a letter dated March 6 from C. J. STEVENS, President of the District of Columbia Section, that nominated Mr. Mason as its candidate.

The following deaths of members of the Academy were reported: MAURICE I. SMITH, on January 26, 1951 (elected May 5, 1939); OWEN B. FRENCH, on February 12, 1951 (elected March 8, 1915); CLARIBEL R. BARNETT, on March 6, 1951 (elected June 13, 1933).

A discussion of increasing the age limit beyond 40 years for nominees for Awards for Scientific Achievement and of granting more than one annual award in each of the three different categories did not result in any recommendation requiring action by the Board.

After discussion the Board voted to discontinue sending engraved certificates of membership to newly elected members. The President was instructed to appoint a committee to consider costs and make recommendations to the Board on the type of certificate and preferred method of reproduction of Certificates of Merit.

446TH MEETING OF BOARD OF MANAGERS

The 446th meeting of the Board of Managers, held in the Cosmos Club on April 16, 1951, was called to order at 8:03 p.m. by the President, NATHAN R. SMITH. Also present were: W. RAMBERG, H. S. RAPPLEYE, J. A. STEVENSON, CHARLES DRECHSLER, C. L. GAZIN, A. T. MCPHERSON, SARA E. BRANHAM, W. R. WEDEL, E. H. WALKER, W. A. DAYTON, L. A. SPINDLER, H. W. HEMPLE, F. M. DEFANDORF, AND, by invitation, MARGARET PITTMAN, J. R. SWALLEN, G. P. WALTON, L. E. YOCUM, and M. A. MASON.

The President announced the following appointments:

(1) E. H. WALKER, of the Smithsonian Institution, as Chairman of the Committee on Membership, in lieu of L. A. SPINDLER, whose resignation was accepted at the last meeting.

(2) Committee on Indexing of the Journal: JOHN E. GRAF, Chairman, WILLIAM N. FENTON, C. F. W. MUESEBECK, PAUL H. OEHSER, J. A. STEVENSON.

Chairman Pittman of the Committee on Meetings reported that the May meeting would be addressed by D. J. Parsons of the Federal Bureau of Investigation, on *Science in crime detection*.

Chairman MASON of the Committee for Encouragement of Science Talent reported on the part taken by members of the Academy in judging exhibits at the Annual Science Fair, and that President SMITH would present awards to the winners at the Science Fair Awards Meeting on April 18 to be held in the evening at the Department of Commerce Auditorium. The Washington Daily News will pay expenses of the winners for a trip to the National Science Fair to be held in St. Louis on May 10, 11, and 12.

The Secretary reported the death of BAILEY E. BROWN on March 9, 1951, and of MERRILL BERNARD on April 13, 1951.

The Treasurer reported contributions of $25 for support of publication of the Science Calendar in local newspapers.

447TH MEETING OF BOARD OF MANAGERS

The 447th meeting of the Board of Managers held in the Cosmos Club on May 14, 1951, was called to order at 8:02 p.m. by the President, NATHAN R. SMITH. Also present were: H. S. RAPPLEYE, J. A. STEVENSON, C. L. GAZIN, SARA E. BRANHAM, E. H. WALKER, W. A. DAYTON, C. A. BETTS, L. A. SPINDLER, A. M. GRIFFIN, F. M. DEFANDORF, and, by invitation, J. R. SWALLEN, G. P. WALTON, L. E. YOCUM, W. N. FENTON, and J. E. GRAF.

By invitation, J. E. GRAF, Chairman, and W. N. FENTON, Secretary of the special Committee on Indexing the Journal, presented a preliminary report for their committee. This report was discussed in considerable detail and on motion was accepted with appreciation and referred to the Executive Committee.

The Secretary reported the death of W. F. ALLEN.

The Treasurer read a letter of resignation from L. R. HAFSTAD which was approved as of January 1, 1951. The Treasurer reported that a total of about $40 had been received from affiliated societies in support of the Science Calendar.

448TH MEETING OF BOARD OF MANAGERS

The 448th meeting of the Board of Managers, held in the Cosmos Club June 18, 1951, was called to order at 8:00 p.m. by the President NATHAN R. SMITH. Also present were: H.S. RAPPLEYE, J. A. STEVENSON, H. A. REHDER, CHAS. DRECHSLER, A. T. MCPHERSON, C. F. W. MUESEBECK, SARA E. BRANHAM, J. J. FAHEY, F. W. POOS, W. A. DAYTON, L. A. SPINDLER, F. M. DEFANDORF, and, by invitation, MARGARET PITTMAN, PAUL H. OEHSER, G. P. WAL-

TON, J. E. GRAF, MISS PATTERSON (Science Service), MR. WAGNER (Dupont Theatre), KEITH JOHNSON (Woodrow Wilson Jr. High School).

Miss Patterson and Messrs. Johnson and Wagner outlined the plan of a benefit premier showing of the film *Kon-Tiki*. It is supposed that the Polynesian Islands may have been originally settled by Peruvians who floated on a raft constructed of balsa wood and bamboo and eventually drifted to those islands. Thus a Norwegian group led by Mr. Thor Heyerdahl constructed a raft and after drifting at the mercy of the prevailing winds and ocean currents for 101 days eventually landed in Tahiti. This feat is considered to afford some credulity in the original thesis of settlement of the Polynesians by Peruvians. The film *Kon-Tiki* is based on this voyage by raft.

After some discussion the Board accepted the proposal that the Washington Academy of Sciences sponsor the premier showing of the film at the Dupont Theatre in Washington for the benefit of the Science Fair Fund.

The Secretary presented a report of the meeting of the Executive Committee that immediately preceded this Board Meeting. Minutes of this meeting are as follows:

Meeting of the Executive Committee in the Cosmos Club Library was called to order at 7:30 p.m. by the President. In attendance: N. R. SMITH, H. S. RAPPLEYE, J. A. STEVENSON, F. M. DEFANDORF.

President Smith reviewed details relative to the proposed publication of the Index of the Journal. He stated that an approximate cost of $6,000 for publication in addition to the $1,500 already expended for the preparation of the card file index by Miss Bradley could be expected on the basis of detailed estimate received by the Special Committee on Indexing the Journal.

Ways and means of reducing the net cost of publication and other details were discussed, and as a result of the deliberation it was decided to recommend to the Board, on the basis that solicitations for outside help would be made in order to reduce the net cost to the Academy, that the index should be published if it could be done at a total cost not to exceed $6,000.

Mr. GRAF reported for the Special Committee on Indexing the Journal, and after reading a letter from Mrs. LEILA F. CLARK, Librarian of the Smithsonian Institution, telling of the value that such a printed index would be to librarians, called upon Mr. OEHSER to present firm estimates of the cost of printing the index. Detailed estimates had been prepared that indicated a cost of $5,705 for 1,000 copies if printed by letter press and $6,053 if printed by offset press methods.

Dr. REHDER as Custodian presented a résumé of the inventory of complete and incomplete sets of the JOURNAL and mentioned a gift of an almost complete set from the Library of the American Optical Co.

Dr. SARA E. BRANHAM presented a summary of thoughts in regard to the activities and responsibilities of the Academy for consideration in the fall.

449TH MEETING OF BOARD OF MANAGERS

The 449th meeting of the Board of Managers, held in the Cosmos Club on October 15, 1951, was called to order at 7:59 p.m. by the President, NATHAN R. SMITH. Others in attendance were: WALTER RAMBERG, H. S. RAPPLEYE, J. A. STEVENSON, CHARLES DRECHSLER, C. L. GAZIN, A. T. MCPHERSON, MILTON HARRIS, SARA E. BRANHAM, JOSEPH J. FAHEY, E. H. WALKER, W. A. DAYTON, C. A. BETTS, R. S. DILL, L. A. SPINDLER, A. M. GRIFFIN, H. G. DORSEY, M. A. MASON, F. M. DEFANDORF, and, by invitation, MARGARET PITTMAN, G. P. WALTON, and L. E. YOCUM.

Dr. YOCUM, Chairman of the Committee on Grants-in-Aid for Research, presented his committee's recommendations in a letter to the President dated October 12, 1951, as follows:

Your committee on grants in aid for research submits the following report and recommends favorable action:

For purchase of a curved barium titanite ultrasonic transducer by Dr. Karl H. Langenstress and Dr. Francis E. Fox. Amount $170.

For purchase of nonmetallic plastic cages for metabolism studies by Dr. Martin Rubin and Dr. M. X. Sullivan.

For purchase of Bakelite and other resins for making models to study stress by a photoelastic polariscope by C. H. Walther. Amount $75.

The Board voted to approve the allotments in the amounts and for the projects recommended.

Mr. MASON, Chairman of the Committee on Encouragement of Science Talent, reported that the benefit premiere performance of the film *Kon-Tiki* resulted in a net balance of $776.22. The Board authorized the Treasurer to turn over the proceeds to Science Service for use in connection with the Science Fair activities.

Dr. MCPHERSON reported that the 6th Annual Science Fair, to be held in Washington this year,

would make use of facilities at the Catholic University for showing the exhibits. It is felt that this location will be satisfactory because of the ample space available for exhibits and for automobile parking.

President SMITH read a memorandum from Past President GRAF, Chairman of the Special Committee on Indexing the Journal, relative to incorporation of an index of the earlier Proceedings with the index of the Journal. The estimated additional cost is $200. President SMITH stated that since this matter had been brought up subsequent to the June meeting, he had polled the Executive Committee, and on the basis that they were 4 to 1 in favor of including the indexing of the Proceedings, he had ordered inclusion of this additional material. The Board voted to affirm this action of the Executive Committee.

President SMITH read a letter from Dr. COONS, a member of the Committee on Awards for Scientific Achievement, outlining reasons why the age limit should be raised to 45 for such awards. Dr. VAN EVERA had made similar recommendations relative to the Science Teaching Award. It was pointed out in the latter instance that one teacher, now over 40, who has done remarkable work, would have received recognition earlier had the Award for Teaching of Science been established as early as the awards for other science groups. The President will ask Dr. VAN EVERA to attend the next meeting of the Board.

450TH MEETING OF BOARD OF MANAGERS

The 450th meeting of the Board of Managers, held in the Cosmos Club on November 19, 1951, was called to order at 8:03 p.m. by the President, NATHAN R. SMITH. Also in attendance were: WALTER RAMBERG, J. A. STEVENSON, CHARLES DRECHSLER, W. F. FOSHAG, C. L. GAZIN, A. T. MCPHERSON, J. J. FAHEY, F. W. POOS, E. H. WALKER, W. R. WEDEL, F. M. DEFANDORF, and, by invitation, MARGARET PITTMAN, L. E. YOCUM, J. I. HOFFMAN, and J. P. E. MORRISON.

Dr. Pittman announced that arrangements had been completed for Dr. WILLIAM E. HIATT, of the Weather Bureau, to speak at the December 20 meeting, on *Precipitation and the water supply*.

President Smith read a letter and report from MR. GRAF, Chairman of the Committee on Indexing the Journal. The following are excerpts from the report, dated November 16, 1951:

TO THE BOARD OF MANAGERS:

The Committee on the Index is glad to be able to report progress on the job assigned to it by the Board of Managers—seeing through to completion the publication of the Index to the first 40 volumes of the Journal of the Academy. As authorized by the Executive Committee, Volumes 1-13 of the Proceedings (the Academy's publication antedating the Journal) have been included; the additional cards have been inserted; and the whole index, comprising 16,570 entries, is now ready to be turned over to the printer.

Bids for the printing of the Index have been obtained from 4 printing firms, 3 in Baltimore and 1 in Lancaster, Pa. (1 Washington printer declined to bid.) The lowest bid, in the amount of $5,928.40, came from the Lord Baltimore Press. As this figure is only a few dollars under the amount that the Board has authorized to be spent on the Index, the Committee has decided to alter the specifications to allow use of a non-rag paper instead of a 50-percent rag stock originally stipulated. This will effect a saving of $300–$400 and thus allow a little more leeway for contingencies. Contract for the printing of the book will be awarded to the Lord Baltimore Press, and it is expected that the copy will be in the printer's hands within the next week.

In authorizing the publication of the Index, at its meeting on June 18, 1951, the Board moved that 'steps be taken to secure outside funds to minimize the net cost to the Academy.' The Index Committee is agreed that the task of raising such funds is definitely outside its province, but feels that the Board might welcome some suggestions pertinent to the problem. In the first place, the Committee thinks that the Academy's constituent societies should all be approached for contributions, in proportion to their interest and resources. All these societies have a stake in the Academy, and they should be given an opportunity to express in a tangible way their broader interests in Washington science, or perhaps to reaffirm such interests. In the second place, certain sources outside of Washington might be explored. The Committee is placing in your hands drafts of two letters that follow up these suggestions.

The Secretary read the report of the Nominating Committee, as follows:

The Nominating Committee, consisting of the Vice-Presidents of the Academy, met in the Library of the Cosmos Club on October 15, 1951. The meeting was called to order at 9:15 p.m. by JOSEPH J. FAHEY, who, as Vice-President for the Washington Section, American Chemical Society, presided as chairman. Others present were: E. H. WALKER, WM. A. DAYTON, C. A. BETTS, R. S. DILL, L. A. SPINDLER, A. M. GRIFFIN, HERBERT G. DORSEY, MARTIN A. MASON, F. M. DEFANDORF.

The nominees selected for the offices to be filled by balloting of the membership in December were as follows:

For President-Elect—F. M. SETZLER
For Secretary—FRANCIS M. DEFANDORF
For Treasurer—HOWARD S. RAPPLEYE
For the Board of Managers:
To serve from January 1952 to January 1953 to fill vacancy of H. P. Barss, resigned:—C. F. W. MUESEBECK
To serve from January 1952 to January 1954 to fill vacancy of J. A. Stevenson, resigned:—MILTON HARRIS
To serve from January 1952 to January 1955 (two to be elected):—ROGER G. BATES, ELOISE B. CRAM, W. W. DIEHL, JAMES I. HOFFMAN

JOSEPH J. FAHEY, *Chairman*.
F. M. DEFANDORF, *Secretary*.

President SMITH announced that he was retiring from his work in the U. S. Department of Agriculture on November 30, 1951, and was leaving Washington and moving to Florida, so that he would not be present at the next meeting. He expressed his appreciation to members of the Board and his Committees for their cooperation and good effort on behalf of the Academy. He then declared the formal meeting adjourned at 9:15 p.m. after inviting those present to remain for refreshments he had provided in the adjoining room.

451ST MEETING OF BOARD OF MANAGERS

The 451st meeting of the Board of Managers, held in the Cosmos Club on December 17, 1951, was called to order at 8:02 p.m. by President-Elect WALTER RAMBERG. Others in attendance were: H. S. RAPPLEYE, J. A. STEVENSON, CHARLES DRECHSLER, SARA E. BRANHAM, W. R. WEDEL, F. W. POOS, E. H. WALKER, W. A. DAYTON, L. A. SPINDLER, A. M. GRIFFIN, F. M. DEFANDORF, and, by invitation, F. W. HOUGH, MARGARET PITTMAN, J. R. SWALLEN, and J. P. E. MORRISON.

Chairman PITTMAN, of the Committee on Meetings, discussed the Academy's Annual Dinner Meeting to be held on January 17 and announced that THOMAS R. HENRY had been chosen as speaker and would show the film *The Secret Land*.

Dr. WALKER presented nominations for membership and expressed appreciation of the work of the Committee on Membership, of which he is Chairman. He discussed what might be done to increase the active membership.

The Secretary explained that the additional nomination for President-Elect of ALAN T. WATERMAN appearing on the election ballot was the result of a nominating petition signed by 38 members of the Academy.

The Board accepted the resignation of Capt. H. W. HEMPLE as Vice-President representing the Society of Military Engineers and elected in his place Col. F. W. HOUGH.

The Secretary mentioned several requests for exchange of journals with other organizations, which had to be refused inasmuch as the Academy does not maintain a library of its own.

The Treasurer told of the receipt of options in the case of two securities owned by the Academy and explained that no Board action was necessary.

[For minutes of 452d meeting of Board of Managers, see April 1952 issue of JOURNAL, p. 135.]

453D MEETING OF BOARD OF MANAGERS

The 453d meeting of the Board of Managers, held in the Cosmos Club on February 18, 1952, was called to order at 8:03 p.m. by President RAMBERG. Other present were: F. M. SETZLER, H. S. RAPPLEYE, J. A. STEVENSON, W. F. FOSHAG, A. T. MCPHERSON, C. F. W. MUESEBECK, SARA E. BRANHAM, MILTON HARRIS, W. W. DIEHL, A. G. MCNISH, W. R. WEDEL, J. K. TAYLOR, F. W. POOS, L. M. HUTCHINS, W. A. DAYTON, C. A. BETTS, A. H. SCOTT, F. W. HOUGH, H. G. DORSEY, F. M. DEFANDORF, and, by invitation, E. H. WALKER, H. W. WELLS, W. N. FENTON, J. R. SWALLEN, L. E. YOCUM, J. P. E. MORRISON, W. T. READ, N. S. DRAKE, and W. L. SCHMITT.

The President announced appointment of the following committeemen for 1952:

Appointed Members of Executive Committee: F. M. SETZLER, WILLIAM A. DAYTON.

Board of Editors of the Journal: WILLIAM F. FOSHAG, Senior Editor; J. C. EWERS, replacing CHARLES DRECHSLER; PHILIP DRUCKER, Associate Editor for a term of 3 years, representing the Anthropological Society of Washington; J. I. HOFFMAN, Associate Editor for a term of 3 years, representing the Chemical Society of Washington.

Committee on Membership: E. H. WALKER (Chairman), M. S. ANDERSON, R. C. DUNCAN, G. T. FAUST, I. B. HANSEN, D. B. JONES, DOROTHY NICKERSON, F. A. SMITH, HEINZ SPECHT, H. M. TRENT, ALFRED WEISSLER.

Committee on Meetings: H. W. WELLS (Chairman), WM. R. CAMPBELL, W. R. CHAPLINE, D. J. DAVIS, H. G. DORSEY, O. W. TORRESON.

Committee on Monographs: W. N. FENTON (Chairman). To January 1955—W. N. FENTON, ALAN STONE.

Committee on Awards for Scientific Achievement: J. R. SWALLEN, General Chairman.

For the Biological Sciences: J. R. SWALLEN (Chairman), L. M. HUTCHINS, MARGARET PITTMAN, F. W. POOS, L. P. SCHULTZ.

For the Engineering Sciences: R. C. DUNCAN (Chairman), A. C. FIELDNER, WAYNE C. HALL, J. W. MCBURNEY, O. S. READING, H. L. WHITTEMORE.

For the Physical Sciences: L. A. WOOD (Chairman), P. H. ABELSON, F. S. DAFT, GEORGE W. IRVING, JR., J. H. MCMILLEN.

For the Teaching of Science: M. A. MASON (Chairman), F. E. FOX, M. H. MARTIN.

Committee on Grants-In-Aid for Research: L. E. YOCUM (Chairman), H. N. EATON, K. F. HERZFELD.

Committee on Policy and Planning: W. A. DAYTON, Chairman. To January 1955—L. W. PARR, F. B. SILSBEE.

Committee on Encouragement of Science Talent: A. T. MCPHERSON, Chairman. To January 1955—A. T. MCPHERSON, W. T. READ.

Committee of Auditors: C. L. GAZIN (Chairman), LOUISE M. RUSSELL, D. R. TATE.

Committee of Tellers: GEORGE P. WALTON (Chairman), GEORGE H. COONS, C. L. GARNER.

The President then called on Dr. A. T. MCPHERSON, Chairman of the Committee on Encouragement of Science Talent, who presented a report for his committee dated February 18, 1952, as follows:

The Committee on the Encouragement of Science Talent presents the following nominations for junior awards for scientific achievement:

WILLIAM WESTON HOOKER, of Anacostia High School, for studies of Pascal's triangle.

ROWLAND SANDER JOHNSON, of Coolidge High School, for studies in electronics.

JOHN ERRETT LANKFORD, of McKinley High School, for observations on variable stars.

JOEL SHAPPIRIO, of Woodrow Wilson High School, for studies on crystal modification.

STUART JOSEPH YUILL, of McKinley High School, for studies on radar equipment.

ROBERT STEPHEN ZIERNICKI, of Priory School, for studies on chemical spectroscopy.

The foregoing candidates were selected from among the entries from District of Columbia Schools in the Eleventh Annual Science Talent Search of the Science Clubs of America sponsored by Westinghouse Educational Foundation and administered by Science Service.

The Board approved the award of Certificates of Merit for those nominated. In the discussion it was pointed out that Chairman McPherson will take up the matter of including students of high schools in the suburban area of metropolitan Washington for consideration next year in making such awards. Arrangements will have to be worked out with the Academies in Maryland and Virginia, since under present arrangements for Science Talent Search, areas outside of the District of Columbia, in nearby Maryland and Virginia, are not grouped with the District.

Chairman McPherson then expressed the concern of his committee with (1) the need for increasing the interest of students in science, (2) the need for allocation of adequate time for laboratory work in science courses, (3) the need of help that might be easily provided by members of the Academy in the form of lectures, etc., for science teachers, and (4) the need for action in encouraging teachers of science in high schools. He expressed the opinion that another committee, arranged for top-level participation, is highly desirable to take care of such a project. In order that the Board might become properly informed about the shortage of engineering and scientific manpower in relation to the national need for increased interest in scientific education in the high schools, Chairman McPherson introduced Dr. W. T. READ, Chairman of the Education Committee of the D. C. Council of Engineering and Architectural Societies, and Prof. N. S. Drake, of the Council of the Chemical Society.

Dr. Read spoke of the meeting of the Engineers Joint Council, Commission on Engineering Manpower, on September 28, 1951, attended by representatives from 28 States. A serious manpower shortage exists not only in engineering but also in the fields of science and mathematics upon which engineering depends. This shortage will become even more acute because student registration for courses in these fields has dropped to alarmingly low numbers. This deplorable trend away from mathematics and science courses in schools in the District and in suburban Maryland and Virginia follows the national trend. The need for cooperation of the Academy and its affiliated societies with the D. C. Council in an endeavor to improve the situation was stressed. It was suggested that continuing and concerted effort must be made to interest more capable and highgrade students to take science and mathematics courses with the view that more should enter scientific and engineering professions. The immediate need is to provide each high school in the metropolitan area with help from those in the professions who can stimulate the necessary interest. We must insure by effective methods that suitable courses of instruction are made available to capable high school students. Individual engineers and scientists with ability must therefore assume additional obligations in their communities to make known the needs of an adequate program. They must individually enlist aid through Parent-Teachers

Associations and other civic agencies and see that they are concerned about adequate support for teachers and provision of proper facilities for instruction. In short, the seriousness of this trend of students away from the pursuit of engineering and scientific careers must be counteracted.

Dr. Read spoke of the effort the national engineering groups are devoting to this problem; notably as an example $10,000 has been provided by the American Society of Metals. He feels that to meet the immediate emergency the help of one engineer and one scientist in every high school this spring should be the goal. His committee is attempting to list people who are willing to work (1) by meeting and advising students; (2) by serving on committees on curricula and the standing of teachers; (3) by speaking on scientific subjects before science clubs; (4) through PTA groups where they have children in schools and can work effectively within such groups.

Professor Drake concluded the discussion by emphasizing the need for excellent instruction in basic mathematics courses. He emphasized that primarily students at this age need to be taught to think and to recognize how scientific problems are approached. Students who show latent ability in science need encouragement lest they be diverted to other less exacting fields of endeavor. Thus well trained teachers are essential.

The ensuing discussion by Board members helped to emphasize the lack of requirements for adequate training in mathematics and science in local high schools.

On motion, the President was directed to appoint a Committee on Scientific Education, to cooperate on behalf of the Academy with the D. C. Council of Engineering and Architectural Societies in their effort to achieve in high schools in the metropolitan area adequate courses and interest among qualified students in mathematics and science.

The Secretary read the Budget submitted for 1952 by the Treasurer, and recommended by the Executive Committee for submission to and adoption by the Board of Managers:

Receipts

	1951	*Estimated 1952*
Account of dues	$4244.84	$4300.00
Subscriptions to JOURNAL	1519.88	1600.00
Interest & dividends sales	2372.67	2000.00
	179.89	500.00
Affiliated societies for Science Calendar	61.09	50.00
Totals	$8378.37	$8450.00

Disbursements

JOURNAL and JOURNAL office	$6500.49	$6850.00
Secretary's office	394.67	550.00
Treasurer's office	262.12	300.00
S.M.& C. of Pubs.	44.35	50.00
Archivist	30.00	20.00
Meetings Committee	256.65	500.00
Membership Committee	—	20.00
Science Fair	100.00	100.00
Science Calendar	55.00	60.00
Totals	$7643.28	$8450.00

This budget is the same as for 1951 except that the JOURNAL allotment has been increased $350; the Archivist's allotment has been decreased $55; and the Science Calendar allotment increased $10.

In the ensuing discussion, Senior Editor FOSHAG mentioned the desirability of increasing the number of pages published in the JOURNAL, suggesting that it be increased by say four additional pages in three issues per year. He also recommended that the Managing Editor, who takes care of much editorial detail, should receive increased compensation. A motion was passed to increase the compensation for work of the Managing Editor from $25 to $40 per month. The Board of Managers then voted to accept and adopt the Budget for 1952 as presented by the Treasurer.

Mr. WELLS, Chairman of the Committee on Meetings, announced that the Awards meeting would be held in March. Probably one meeting will be devoted to a discussion of the problem of developing adequate scientific manpower.

Affiliation of the District of Columbia Section of the Society for Experimental Biology and Medicine was unanimously approved.

F. M. DEFANDORF, *Secretary.*

Obituary

CLARIBEL RUTH BARNETT was born in Kent, Ohio, on March 26, 1872, the daughter of George and Lucina (Deuel) Barnett. Her father was of English birth but had come to this country as a young man. She had a happy childhood in Kent and always retained a great affection for it, often recalling the games and adventures in which she seems to have been a leader. Her education was begun in the Kent public schools, and she prepared for college at Western Reserve Academy

in Hudson, Ohio. She was graduated from the University of Michigan in 1893, with the Ph.B. degree, and later received a membership in Phi Beta Kappa from that university. In October 1893 she entered the New York State Library School at Albany, and in the spring of 1895 she took and passed the Civil Service examination for cataloger in the U. S. Department of Agriculture Library.

In the year 1907 Secretary of Agriculture James Wilson appointed Miss Barnett to the position of librarian, which she held until her retirement in November 1940. Her interests were by no means limited to her own library. Cooperative undertakings made a special appeal to her, and realizing the need for greater cooperation among agricultural libraries she was responsible for organizing the Agricultural Libraries Section of the American Library Association. Another form of mutual help is found in the emphasis placed on interlibrary loans. The main source of such loans to her own library was the Library of Congress, together with the other special government libraries. The largest class of borrowers from her own library were the State agricultural colleges and experiment stations, but loans were made also to other scientific and public libraries needing them for serious work.

In connection with this work Miss Barnett inaugurated a new and pioneering service, called the bibliofilm service. Its purpose was to make microfilm copies of articles to send to out-of-town borrowers instead of lending bound volumes. For some time photostat copies had been used for this purpose, but the microfilms were even more useful, especially for long articles.

Miss Barnett was a prominent member of the American Library Association, and in addition to serving as second vice-president in 1921–22 she was chairman of its Oberly Memorial Fund Committee and a member of its Board of Resources of American Libraries. She was an elected member of the American Library Institute. She was active in library circles in Washington and was president of the District of Columbia Library Association in 1929–30.

The history of agriculture in this country was a subject in which she was much interested. She was a charter member of the Agricultural History Society and served as a member of the committee which organized the Washington section in the early 1920's. For its journal, Agricultural History, she wrote an article entitled "The Agricultural Museum, an Early Agricultural Periodical," which appeared in April, 1928. As a matter of interest to herself she did much research on the lives and personalities of the early United States officials in charge of agricultural work before the Department was established and corresponded with their descendants to get information about them. Among these were Henry L. Ellsworth (1791–1858) and Horace Capron (1804–1885). She contributed 25 biographies of agriculturists, including Secretary James Wilson, "Tama Jim," to the "Dictionary of American Biography."

She was a member of the Library Advisory Wage Committee of the U. S. Joint Congressional Committee on Reclassification of Salaries in 1919–20. She was a member of the Washington Academy of Sciences, a fellow of the American Association for the Advancement of Science and the Bibliographical Society of America, and a member of the American Association of University Women, Phi Beta Kappa, and Pi Gamma Mu honorary society.

As a librarian, Miss Barnett's principal aim was to give all possible service to the users of the library, especially to the scientific workers of the Department of Agriculture, and also to those of other institutions, foremost among them the State agricultural colleges and experiment stations. Since the library has an international reputation it is visited by many workers from outside Washington and even the United States. These were always welcomed most cordially, and no trouble was spared in giving help in identifying and assembling the publications needed.

One of the fellow members of the Agricultural History Society wrote of Miss Barnett at the time of her retirement in 1940: "Her great service was performed so modestly, so entirely beyond public notice, and was at the very root of the achievements of other workers, that it is impossible to estimate it."

Personally she was modest as to her own abilities and attainments, although firmly maintaining her decisions after she had thought a thing through. She was interested in other people and was well loved by her staff. She had a great capacity for friendship and possessed an unusual number of devoted friends to whom she herself was equally devoted.

The last six years of her life were spent as an invalid following a stroke in 1945, and she died on March 6, 1951. She was buried in her old home town of Kent, Ohio.

EMMA B. HAWKS

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